AUGUST, 1953

# HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION

College Courses in Air Conditioning Page 87

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# VACUUM ISN'T VACUUM

## TO A STEAM TRAP

### . . . It's Just Pressure Below Atmospheric

**ONLY 2½¢ per year per trap** parts costs on traps averaging 11 years of service at Globe Steel Tubes Company, Milwaukee, Wisconsin.

***PRACTICALLY ZERO maintenance,*** complete satisfaction with traps after 12 years service on 10 lbs. pressure, 5" vacuum—Liquid Veneer Corp., Buffalo, N.Y.

BUYERS are sometimes told that steam traps for vacuum return service must be "different"—requiring, we suppose, some mysterious ability to recognize vacuum and act accordingly.

The truth is that vacuum isn't vacuum to any steam trap. It is just pressure below atmospheric pressure. All vacuum does is increase the pressure differential across the trap orifice. An Armstrong trap doesn't care whether it discharges to vacuum, back pressure or atmosphere. It works just the same in all cases.

Because Armstrong traps don't have to wait for condensate to cool, drainage is fast and equipment temperatures and BTU output are maximum.

Armstrong traps won't cause you to lose vacuum. Any flash steam from their discharge is quickly condensed. *It is the leaky traps that make it hard to hold vacuum!*

The mechanisms in Armstrong traps for low pressure vacuum return service are identical in design, workmanship and materials to those used in traps for 900°F, 950 lbs. pressure. They can't help but operate a long, long time without leaking. This makes it nice for the maintenance man, too.

Fast heat-up, high temperatures, low maintenance, long life—all wrapped up in one package. Ask your Armstrong Representative to go over your vacuum heating system with you.

**ARMSTRONG MACHINE WORKS**
**846 Maple St., Three Rivers, Michigan**

*Send for 4-page Bulletin No. 223, "Vacuum Isn't Vacuum"—a complete discussion of vacuum, effect on trap selection, causes of vacuum loss, effect of flash steam, etc. Free on request. Just fill in and mail the coupon.

**ARMSTRONG MACHINE WORKS**
**846 Maple St., Three Rivers, Michigan**
**Please send Bulletin 223, "Vacuum Isn't Vacuum"**

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# LIFE INSURANCE ON 10,000 ORCHIDS

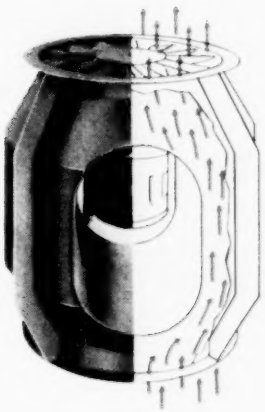
Orchid grower Walton Riffe, owner of Walton's Greenhouse, Dayton, Ohio, with some of his rare specimens. The two DeBothezat Induced Draft Bifurcator Fans in the background are mounted in the boiler breeching. Each fan serves two boilers.

A sudden drop in temperature can put an orchid grower out of business overnight. That's why Walton Riffe installed an automatic heating plant, complete with stand-by boilers, in his greenhouses.

To be sure of adequate boiler draft at all times, this famous grower mounted two DeBothezat Induced Draft Bifurcator Fans in the breeching. Now, Mr. Riffe doesn't worry. Dependable DeBothezat Induced Draft Bifurcator Fans produce a positive controlled draft that helps his system to maintain tropical temperatures regardless of weather.

Remember DeBothezat Induced Draft Bifurcator Fans the next time you have a stack problem. These fans provide a constant, controlled draft for boilers and furnaces at all times. They permit boilers to operate at maximum efficiency under any load, regardless of weather. And the cost of an Induced Draft Bifurcator Fan is usually only a fraction of the cost of erecting an old-fashioned brick or steel stack.

Ask your DeBothezat representative — you'll find him listed in the phone book under "Ventilating Equipment" — or write our factory, Dept. HV-853, for illustrated catalog HV-853.



## HOW BIFURCATOR WORKS

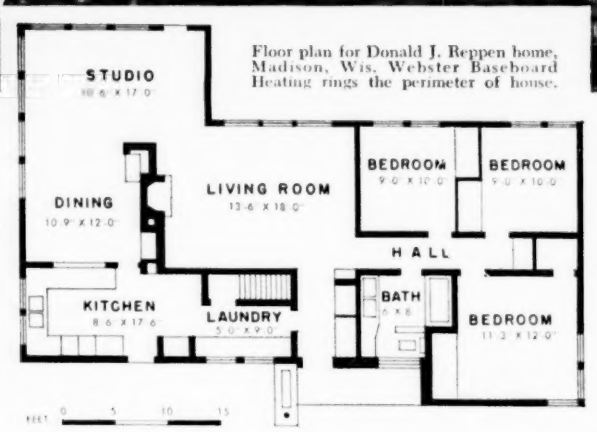
The Induced Draft Bifurcator is a motor driven axial-flow fan in a divided housing. Motor is in an isolated chamber around which flue gases are by-passed (bifurcated) so that the motor always remains cool, clean and accessible. Induced Draft Bifurcators are built in twenty-four sizes, for high pressure boilers delivering up to 60,000 pounds of steam per hour and for low pressure boilers rated up to 190,000 EDR.

**DeBothezat Fans**

**Division of American Machine and Metals, Inc.**

**EAST MOLINE, ILLINOIS**

Webster Baseboard Heating beneath picture windows in Madison, Wis., artist's home. Heating Contractor: Power, Long and Fenske, Madison.




Floor plan for Donald J. Reppen home, Madison, Wis. Webster Baseboard Heating rings the perimeter of house.

# *Here's Comfort*

## For a Cold Wisconsin Winter

**. . . with Tru-Perimeter Heating. All outside walls, including picture windows, are evenly warmed with Forced Hot Water Webster Baseboard Heating.**

**. . . with Solar Heating. Heat can be shut off completely on a sunny winter day. There is no heat lag.**

Following the advice of a University of Wisconsin heating engineer, the Donald J. Reppens had Webster Baseboard Heating installed when they built their home in the winter of 1950-51. They also planned for solar heating with the proper amount of roof overhang on the south and west exposures which are practically walls of glass.

Here's why the Reppens like Webster Baseboard Heating:

(1) Heating Comfort . . . "Floor to ceiling temperatures vary only 3 degrees. This means good fuel economy, too."

(2) Solved a Solar Heating Problem . . . Warms large picture window areas."

(3) Cleanliness . . . "I don't think a cleaner heating system could be installed."

(4) Inconspicuousness . . . "No interference with furniture or draperies."

Let us give you full details about Webster Baseboard Heating — for new homes or for modernization. Call your Webster Representative or write us.

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**BASEBOARD HEATING**

# HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, PLUMBING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

## AUGUST, 1953

**VOLUME 50—NO. 8**

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# Washington News

LORING F. OVERMAN

WITH mixed emotions, Washington took stock of its first half-year under a new Administration. Gone was the free and easy feeling among government employees that an ever-expanding network of federal bureaus could be depended upon to find a position for everyone displaced, or to create a new job for each title discontinued. Washingtonians were beginning to find out that an economy program no longer means merely a mass migration from one government payroll to another.

Cutbacks were affecting others, too. Among them were some very large defense contractors and subcontractors, as well as their thousands of employees. Many were beginning to wonder, with the economy shoe pinching their own toes, whether this business of government saving is all that it is cracked up to be.

Despite all such curtailment, Washington observed that the new Administration had not been able to balance the budget, and that instead of allowing the controversial Excess Profits Tax to expire as scheduled on June 30, a terrific fight had been waged to save the $800 million which the Treasury would have lost had the tax been discontinued. Of greater importance to the Administration than the money involved was the "loss of face" which would have resulted if Congress had failed to support the President in his request for continuation of the tax.

Perhaps the most important conclusion that can be drawn at the half-year mark is that Capitol Hill and the White House are still able to work together when the chips are down. This conclusion lends new meaning to reorganization plans and other policy pronouncements coming out of the White House with increasing frequency.

### Deferred Dividends Promised

To those who hold that prosperity of this country need not be predicated upon war production or government expenditures, today's curtailments forecast reductions of at least $12 billion in the 1954 fiscal budget. This, in turn, should make possible the substantial tax cuts which the new Administration promised when electioneering. Inability to reduce the 1953 budget is due, Administration spokesmen claim, to the fact that commitments made many months ago are now reaching the C.O.D. stage.

But for '54, it is claimed, things are going to be different. At press time, the House cut $3 billion from 10 appropriations bills in which $17 billion had been requested. As for the Defense budget, the House Appropriations Committee reported out a bill for $34.4 billion instead of the $40.7 billion requested—a reduction of $6.3 billion. An additional reduction of $2 billion in defense funds is effected by included costs of the Korean war in the overall budget. In the past, that item had been handled separately.

A third saving of approximately $3.1 billion is expected when final figures are in on the foreign aid budget. The total of these savings adds up to approximately $14.4 billion. Those who think that taxes are too high concede that such a saving would be a step in the right direction.

Reductions in proposed expenditures, followed by cuts in appropriations, offer an unbeatable way to cut taxes, according to Representative Daniel A. Reed, Chairman of the tax-writing House Ways and Means Committee. Chairman Reed feels that he went down "bloody but with head unbowed" in his fight to prevent extension of the Excess Profits Tax. He still feels, however, that the right way to curtail government spending is to cut off the flow of money. "With governments as with individuals," reminds Chairman Reed, "folks who can't get their hands on a lot of money will find ways to get along with less."

### ODM Creates Coordinating Group

Among the new policy definitions coming out of Washington is DMO-6 revised, through which the Office of Defense Mobilization establishes a Central Coordinating Committee to supervise the activities of Regional Defense Mobilization Committees. These latter committees include one for each region of the Commerce Department and the Labor Department's Manpower Administration. They were established to coordinate such matters as defense production, labor supply, housing and community facilities, including civil defense; reduction of urban vulnerability, and post-attack rehabilitation. They were composed of government officials in the regional offices. DMO-6, which was first issued in February of 1951, and amended several times since, is brought up to date by the present revision.

### Reorganization Measures Become Law

Another policy determination step was taken by President Eisenhower when he signed into law two measures (S106) providing for a further "Hoover-like" study of Government organizations, and (S1514), which provides for a new commission to study overlapping functions and taxes of the State and Federal governments.

S106 establishes a new commission of 12—four to be named by the President, four by the Speaker of the House, and four by the Presiding Officer of the Senate. The new group will have a broader field of study than the now famous Hoover Commission, which operated from 1947 to late 1949. Looking into federal activities which compete with private business will be one of the duties of the new commission.

S1514 calls for a 25-man Commission on Governmental Functions and Fiscal Resources. The President is to appoint 15 (no more than nine from one political party). Five each are to be appointed by the Senate and the House, from their own memberships.

Both reorganization plans are considered as important parts of the Administration's plan to streamline the federal government, and to clarify the tax relationship between the national and state governments.

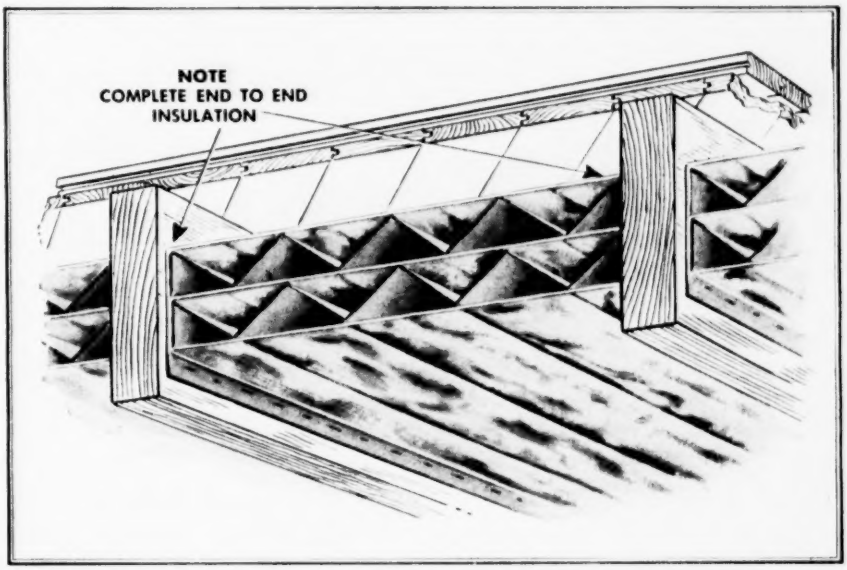
### Three-Level Defense Program Planned

A new concept of the Administration's defense mobilization policy was stated recently before the House Appropriations Committee by Dr. Arthur S. Flemming,

# NEWEST INSULATION FULLY INSULATES FROM END TO END

***Gives Every Fraction of an Inch Between Joists or Studs Maximum Protection Against Heat Loss and Condensation Formation.***

**CLOSELY** hugging for its entire depth the studs or joists to which its flanges are stapled, a new, improved form of aluminum insulation gives complete insulation coverage over the entire surface area it shields. The protection afforded by multiple sheets of accordion aluminum against condensation formation and heatflow is increased at the ends.




Pat. Applied For

Like its predecessor, this new form of multiple accordion aluminum is prefabricated to create automatically a "blanket" of alternating layers of air, aluminum and fiber partitions as it is installed. But this "blanket" is now of **uniform** depth. It has high reflectivity, low absorptivity, and low emissivity of heat rays; low conduction because of preponderant air spaces of low density. It s layers of aluminum and fiber retard inner and outer convection. Because of its slight mass there is little heat storage. It is practically non-condensation forming. A discussion of "how aluminum insulates—and why," will be found in Thermal Test Coefficients of Aluminum Insulation for Buildings," published by the American Society of Heating & Ventilating Engineers. A free copy, and samples of the new insulation sent on request.

The new, "complete coverage," multiple accordion aluminum is being made the standard Infra Insulation, Types 6-$S_i$, 4-$S_i$.

**COST OF INFRA INSULATION INSTALLED**

**in new construction between wood joists, material with labor,**

**Type 6-$S_i$ under 9½¢ sq. ft.**
**Type 4-$S_i$ under 7½¢ sq. ft.**
**Type 4-S Jr. under 7½¢ sq. ft.**

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Director of Defense Mobilization. Explained Mobilizer Flemming:

"I think it is clear that the policy of the Administration in the defense mobilization field can be summarized under three headings: One, to reach a plateau that will enable us to deal with would-be aggressors from a position of strength; two, to stay on that plateau once we have reached it; and three, to develop a program which will provide us with an industrial position or plans for it from which we could move rapidly to maximum production rates of balanced output of war and war-supporting goods in the event of all-out mobilization. The Office of Defense Mobilization has the responsibility of assisting the President in achieving these objectives."

In its studies of defense agencies, members of the House Appropriations appeared to be having some difficulty in distinguishing between areas of overlap involving the Office of Defense Mobilization, and the National Production Authority, which is headed by Horace B. McCoy. Mr. McCoy explained that his agency is concerned with:

(1) Operation of the Defense Materials System to assure the availability of steel, copper and aluminum to meet requirements of Defense Department and Atomic Energy Commission.

(2) Mobilization readiness under policies established by the Office of Defense Mobilization. Here the job is to identify deficiencies in the so-called mobilization base.

(3) Tax amortization, in which NPA reviews applications for rapid amortization of plant expansion costs.

(4) Stockpiling.

(5) Post-attack planning.

### Ten Years of Foreign Aid

Any who may be fearful lest military orders be cut back too rapidly, will find food for thought in a prediction that U. S. military aid abroad will have to continue for another 10 years. The forecast was made by Mutual Security Director Harold Stassen, testifying before the Senate Appropriations Committee. He said that economic aid could possibly be terminated sooner, but that military assistance may have to continue for another decade.

### Permanent Rapid Amortization

Legislation providing for permanent, five-year amortization of new plant and other capitalized facilities has been proposed by Senator Capehart. The Senator contends that such a plan will (1) help relieve the housing shortage, (2) help small business enterprises, (3) encourage veterans to enter business, (4) stabilize employment and production, (5) lower prices and at the same time raise the standard of living, (6) balance capital assets against production, that ratio having declined since 1929, (7) increase the wealth and income of the nation, and (8) give the nation the strength it needs in war or peace.

Senator Capehart conceded that the immediate effect of the bill would be to cut federal tax revenues, but he said that the long-range effect would be to raise national tax takes. Even if the adoption of the policy of accelerated amortization does not stimulate business and thus increase revenue, the Senator said, total business income subject to tax will not be significantly altered over a period of years.

Rapid tax amortization has, up to the present, been used to induce business to construct defense plants.

### Hospital Construction Appropriation Upped

One of the few appropriations bills being upped instead of trimmed is HR5246, the Labor-Welfare Departments' appropriation bill. The action is of interest to the heating and air-conditioning industries because of increases in the hospital construction program. The Senate, in considering the measure, returned $15 million to the amount allowed for new hospital construction. This raises the total to $75 million.

### Surplus Sales Again Studied

With so much of the emphasis having been placed upon production for defense, it is startling to find a House Government Operations subcommittee "surprised and displeased" that the Defense Department is doing so little planning "in anticipation of the impending declarations of billions of dollars worth of surplus stocks." The subcommittee found the following situation with reference to surplus property:

"The Army estimated that it has in depots excess stocks with an acquisition value of approximately $2.5 billion. During fiscal years 1951 and 1952 only $88 million worth of surplus property (acquisition value) was transferred within the Government or given away, and $303 million worth was sold, the sales netting only $21 million.

"Navy reports a similar situation. Of a total inventory of $13 billion, it was estimated that there is from $3 to $5 billion worth of surplus which should be removed from Navy warehouses.

"The Air Force reported that $275 million worth of stock on hand are excess, although this does not include old equipment which is still being retained for possible use. In view of the Army and Navy estimates, the subcommittee is inclined to believe that the Air Force must be unaware of the actual size of its excess and potentially surplus properties.

"The obsolescence factor alone is bound to generate surpluses amounting to hundreds of millions and possibly billions of dollars within the next few years. Unless a practical plan for disposal is developed now, the Government stands to lose an unpredictable amount of money. The experience of the commercial world in merchandising and distribution should be obtained immediately in order that a sensible, businesslike plan may be developed for the benefit of the taxpayer."

### Air-Conditioning Shipments Steady

The Census Bureau reports that 1951 and 1952 shipments of components and accessories for air conditioning and refrigeration equipment were virtually identical at $213 million.

Shipments of condensing units in 1952 amounted to 698,473 units valued at $64,334,000 compared with 840,176 units valued at $75,672,000 in 1951. A total of 1,677,300 units of compressors were shipped in 1952 at a value of $71,047,000, an increase of 59% in number and 25% in value over 1951.

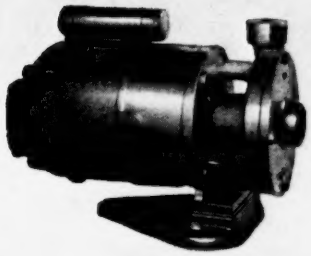
Heat exchanger equipment shipments valued at $63,456,000 in 1952 compared with $64,935,000 in 1951. Shipments of self-contained air conditioning units reached 424,105 units valued at $133,101,000 in 1952, up 30%.

ALLIS-CHALMERS

Air Conditioning PUMPS

# Easy-to-Install pumps

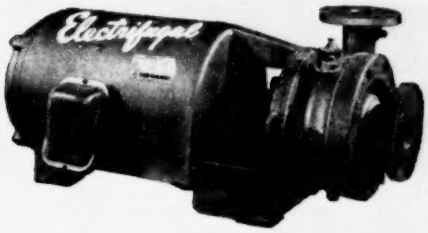
## MEET 90% OF AIR CONDITIONING NEEDS



### FHP pump

**Up to 80 gpm, heads to 125 feet.**

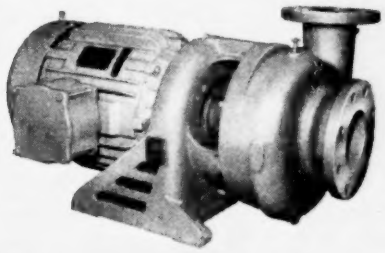
Compact pump and motor requires only two bolts for installation. Rigid construction holds alignment for longer bearing and seal life. Mechanical seal. Open impeller economy model does adequate job on many installations at very low cost. Closed impeller model for higher heads. Also available as frame-type pump for separate mounting.




### Electrifugal pump

**Up to 500 gpm, heads to 220 feet.**

Only pump with unit-cast frame. Motor and pump are mounted on a single shaft in a one-piece rigid cast-iron frame. Alignment is rigidly held but there is plenty of space for maintenance. Installation requires only four bolts. Standard packing or mechanical seal available. Also built as frame-type pump for separate mounting.



### Supporting adapter pump

**Up to 2500 gpm, heads to 550 feet.**

Flange motor and pump mounted on sturdy cast-iron supporting adapter. Motor and pump use same shaft. Rigidity assures vibrationless operation and long bearing life. Only four bolts required for installation. Available with standard packing or mechanical seal. Built in same ratings as frame-type pump for separate mounting.

## FREE ENGINEERING HELP

YOUR ALLIS-CHALMERS PUMP REPRESENTATIVE is thoroughly familiar with pump problems in air conditioning equipment. He can offer you valuable suggestions in planning your equipment and installations. Call your Allis-Chalmers Authorized Distributor or District Office when you need help with your pump problems.

Write Allis-Chalmers, Milwaukee 1, Wisconsin, for centrifugal pump Bulletins 52B7529, 52B6140 and 52B6083 describing these air conditioning pumps.

A-3971

*Electrifugal* is an Allis-Chalmers trademark.

# ALLIS-CHALMERS

# BRIEFLY STATED

• Dr. Homer Addams, a charter member and past president of ASHVE, died on July 3rd at Germantown Hospital, Philadelphia, Pa. His age was 80. Dr. Addams was an outstanding authority in the field of heating, ventilating and air conditioning. At the time of his death he was chairman of the board of directors, Fitzgibbons Boiler Company, Inc., New York, N. Y.

• An industry-operated laboratory is being constructed in Columbus, Ohio, to house certain activities of the General Program of Bituminous Coal Research, Inc., the national research agency of the bituminous coal industry. The building will be substantially completed and ready for occupancy on August 15. The new laboratory will have 10,000 feet of floor space and will house the Columbus engineering staff and laboratory equipment. The administration headquarters of BCR will continue in Pittsburgh, including research on chemical process uses of coal, markets, and the handling of BCR publications.

• Murray Corporation of America announced from Detroit headquarters July 1 the purchase of the Eljer Company, of Ford City, Pa., one of the country's largest manufacturers of plumbing fixtures. Byron C. Gould, president, said The Murray Corporation will acquire the capital stock of the Eljer Company for approximately $16,000,000. Eljer will be operated as a Murray subsidiary to retain the Eljer name. Present plans contemplate no change in the management of the Eljer Company with the exception of R. E. Crane, president of Eljer, who is retiring, Mr. Gould said. The acquisition, he added, puts Murray into a strategic marketing position in full control of the manufacture and sale of complete lines of cast-iron, pressed steel, and vitreous china plumbing fixtures, sink and cabinet combinations, and brass fittings.

• John McCardle, formerly manager of the Dayton, Ohio, sales office of Minneapolis-Honeywell Regulator Co., has been appointed market manager of gas controls, with headquarters in the company's executive offices at Minneapolis. He is being succeeded at Dayton by Earl Hoefler, who is rejoining the company after two years service with the Navy. McCardle joined Honeywell in 1946 and became manager of the Dayton office in 1949. The promotion of Karl Schick to sales manager of the Original Equipment Division of Minneapolis-Honeywell Regulator Company is also announced. Mr. Schick has been sales manager of the company's gas controls division since 1949. The appointment of Dr. Finn J. Larsen as director of research for Minneapolis-Honeywell was announced recently. Dr. Larsen, a member of the company's research and engineering organization since 1943, succeeds Dr. Waldo Kliever who has resigned to accept a position with another company.

• The General Electric Company's Air Conditioning Division announced today that part of its home heating and cooling department would be transferred from Bloomfield to Trenton, N. J., in a move to expand production facilities and meet increasing demand for home air conditioning.

• One of the world's most air conditioned ships, the Swedish-American Line's new M. S. Kungsholm, will make its trial run late in July. The maiden voyage of the 22,000 ton luxury passenger liner across the Atlantic to New York is set for late November. Final installation of the Carrier Weathermaster air conditioning system is now being made as the 600-foot liner nears completion in Flushing, The Netherlands. The system will move warm air through the ship during the winter as well as provide cool dehumidified air in summertime. The entire passenger accommodations, living quarters for officers and crew and a large area of the service spaces are conditioned. While the public rooms will be regulated by a central plant system, the passenger cabins offer individual control of temperature. The entire air conditioning and ventilation plant has a total air handling capacity of 350,000 cubic feet per minute. Two refrigerating plants, including one for the refrigerated cargo space and provision store rooms, total 650 tons of cooling capacity.

• The Kold-Hold Manufacturing Co., Lansing, Mich., manufacturer of refrigeration equipment and products in the industrial and domestic heating fields, has announced a change in its corporate name to Tranter Manufacturing, Inc., effective at once. James R. Tranter, Kold-Hold president and general manager who will continue in the same capacities in the company that now bears his name, pointed out that the name change will have no effect on ownership of the company or its corporate structure. The original Kold-Hold product now represents less than a tenth of the total business of the company, he said. Kold-Hold was founded in 1931 by the late Ransom E. Olds, founder of the Oldsmobile and Reo motor car companies.

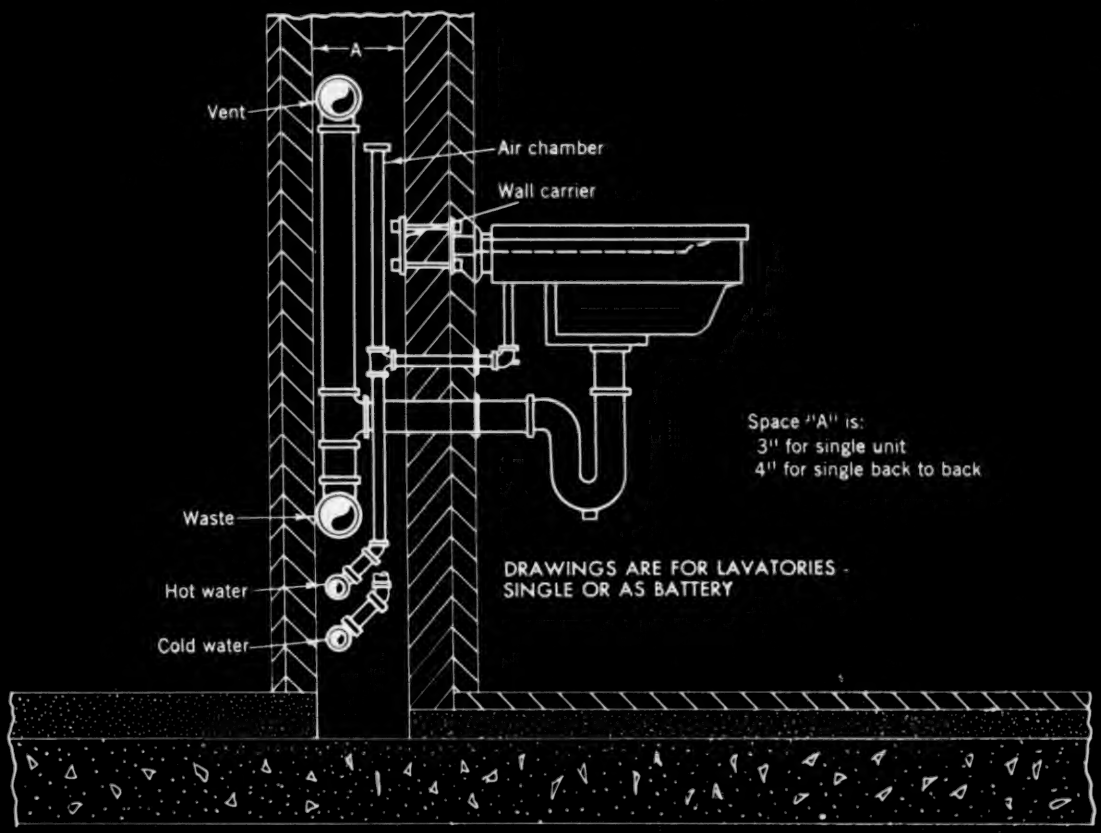
• The following officers were elected at the 38th annual meeting of I-B-R: Robert S. Waters, chairman of the board, The National Radiator Co., Johnstown, Pa., chairman; and H. F. Randolph, president, The International Heater Co., Utica, N. Y., vice chairman. R. E. Ferry is treasurer as well as general manager.

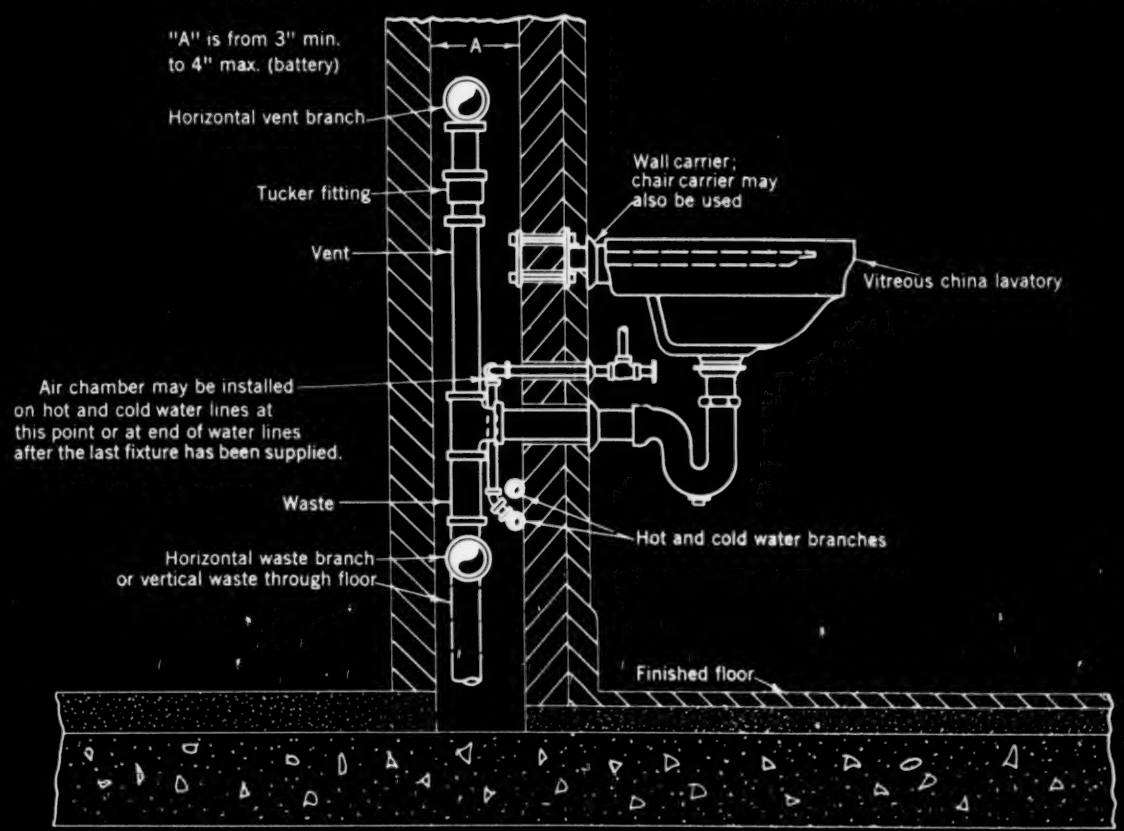
• Marking the company's third expansion in the past year, plans for immediate construction of a new plant in Burbank, California, were announced by W. A. Ray, president of General Controls Co. The new 120,000 sq ft manufacturing plant, designed to augment production of the Appliance Controls Division, will be located just across the city boundary line from the General Controls main plant and headquarters in Glendale.

• A contract has been signed for the construction of a modern, one-floor-plan, completely air conditioned factory on a 16½ acre site purchased by Brunner Manufacturing Co. at Gainesville, Georgia.

• Herbert N. Eaton, recently retired as chief of the Hydraulics Section of the National Bureau of Standards, Washington, D. C., has been retained as a technical consultant to the Research Committee for the Bituminized-Fibre Pipe Industry, representing Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y.; Brown Co., Berlin, N. H., and Line Material Co., Milwaukee, Wis.

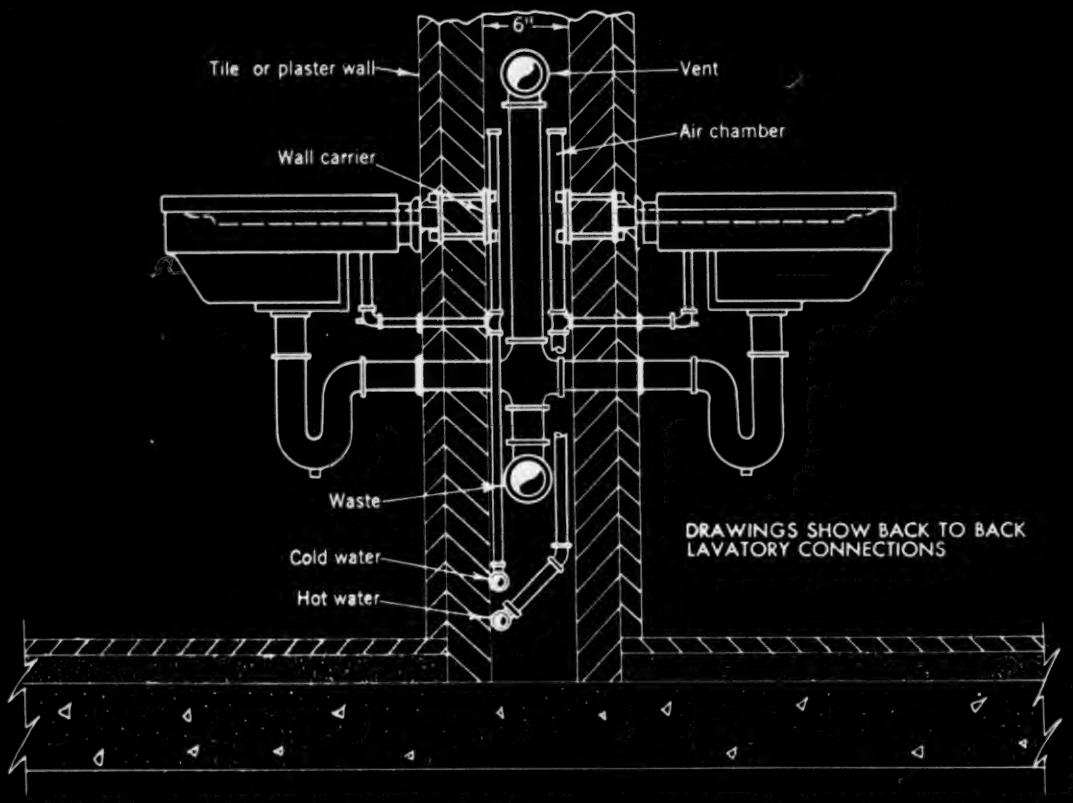
# LAVATORY CONNECTIONS

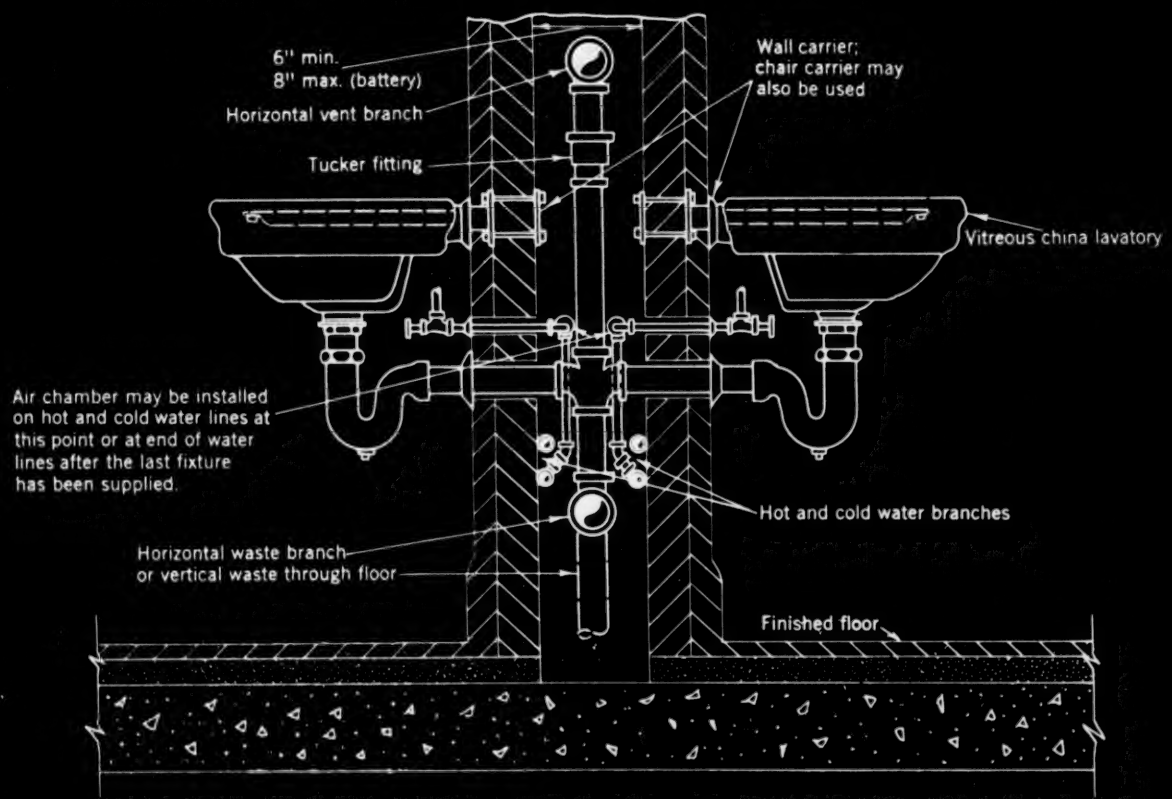



HEATING AND VENTILATING'S DETAIL SHEET

# LAVATORY CONNECTIONS

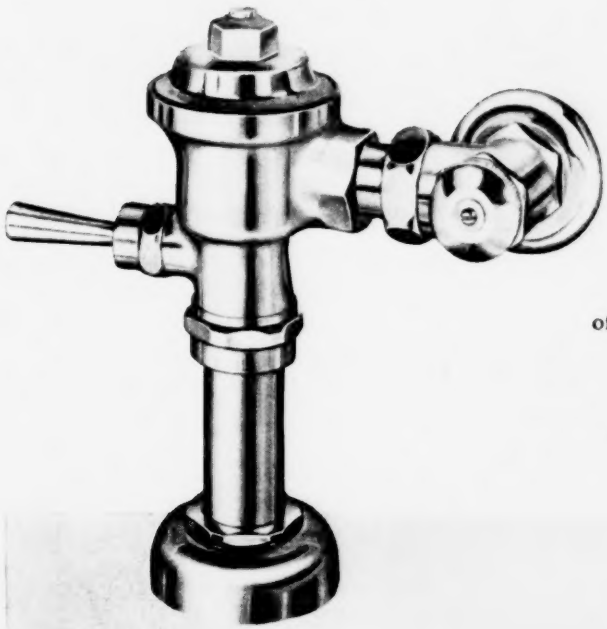




6" min.
8" max. (battery)
Horizontal vent branch
Tucker fitting
Wall carrier; chair carrier may also be used
Vitreous china lavatory
Air chamber may be installed on hot and cold water lines at this point or at end of water lines after the last fixture has been supplied.
Hot and cold water branches
Horizontal waste branch or vertical waste through floor
Finished floor

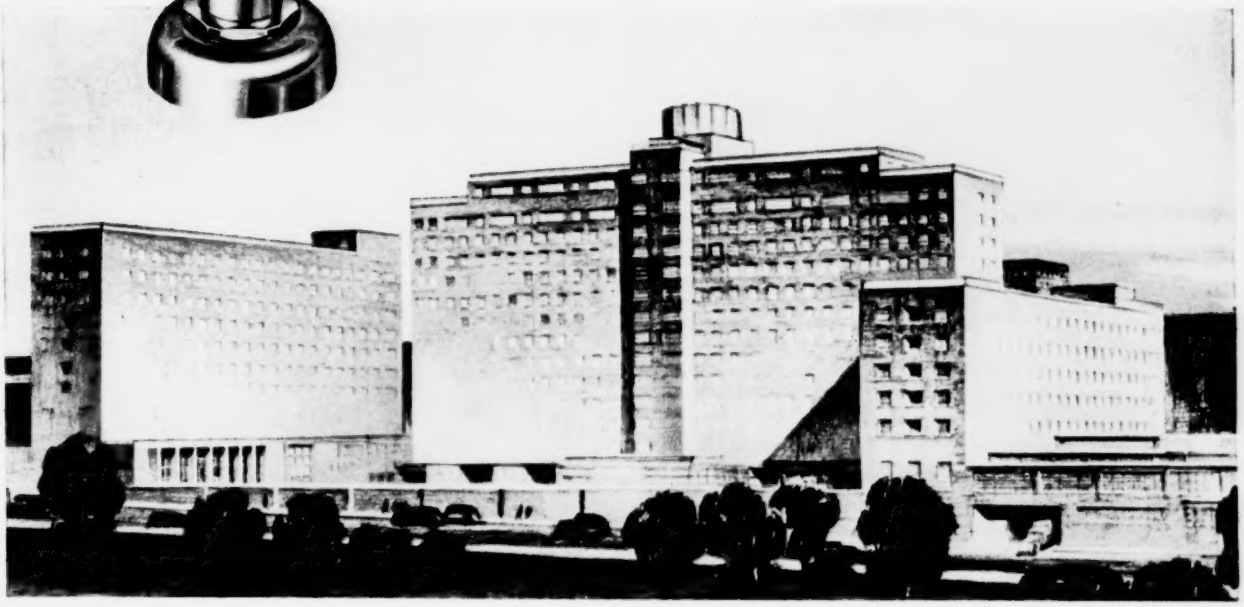
HOOKUPS THROUGH THE COOPERATION OF SYSKA AND HENNESSY, INC., NEW YORK, N.Y., AND LOUIS BLENDERMANN, GLEN COVE, N.Y.

## HEATING AND VENTILATING'S DETAIL SHEET

# *And in New York* – A FUTURE OF FAULTLESS SERVICE



One of the more impressive units in the revitalization of New York's East Side – and a recent COYNE & DELANY installation – is this huge Nurses School and Residence, adjoining famed Bellevue Hospital. Answering a long felt need, the school nicely complements the activities of the hospital proper, just as the selection of COYNE & DELANY diaphragm type FLUSH VALVES for this new building complements the DELANY VALVES installed in the existing hospital years ago – valves still unmatched in performance.



BELLEVUE HOSPITAL
NURSES SCHOOL & RESIDENCE
*New York City*
CITY OF N. Y., DEPT. OF PUBLIC WORKS
FRED A. ZURMUHLEN, Comm.
ALFRED HOPKINS & ASSOC.
*architects*
JAROS, BAUM & BOLLES
*mechanical engineers*
FAR PLUMBING CO., INC.
*plumbing contractor*
WEBSTER PLUMBING SUPPLY, INC.
*wholesale distributor*
AMERICAN RADIATOR & STANDARD SANITARY
*plumbing fixtures manufacturers*

*Under trying water conditions, an invaluable feature of all DELANY VALVES is the protected monel metal bypass shown at left. In this trouble-susceptible area in all flush valves, the use of monel precludes corrosion. Further real protection of the minute orifice against clogging by sand and debris is afforded by a fine mesh monel screen. It is sluiced clean with every flush, limiting the need for periodic dismantling and cleansing.*

**COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK**

IN CANADA: THE JAMES ROBERTSON CO., LTD.

**DELANY** *Flush* **VALVES** Since 1879

BARBER COLMAN

# "UNI-FLO" ENGINEERED Air Distribution

**New Uni-Flo High Velocity System proves itself—**

**is extended to second and third floor addition of** Allstate Insurance Company

Architects: Dunlap & Esgar. Consulting Engineer: William Goodman. Ventilating Contractor: The Haines Company. General Contractor: Kaiser-Ducett Company, all of Chicago.

**Lobby** of impressive Allstate Insurance Company building at **Skokie,** Illinois. Note Uni-Flo Sidewall Diffusers near ceiling which deliver low velocity air quietly for comfort of occupants.

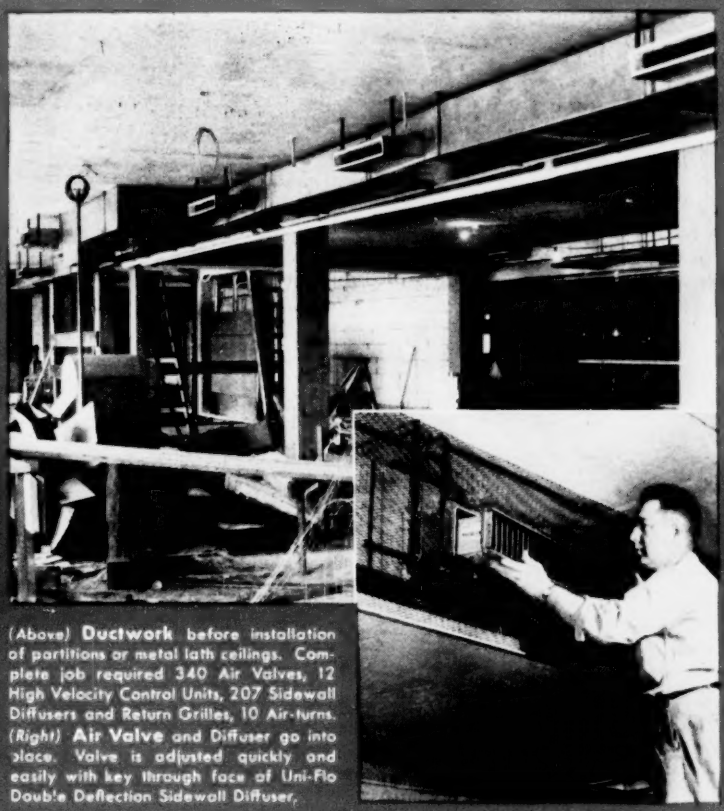
**Cutaway** *of patented Uni-Flo Air Valve in short take-off from main duct. Valve reduces high velocity air to normal flow with whisper-quiet results. Call on Barber-Colman for accumulated experience and a group of new engineering developments which solve high velocity problems.*

Nothing succeeds like success! Trial of Barber-Colman's new high velocity system in the first floor of Allstate Insurance Company's new building led to adoption of the same system for the second and third floor addition now being built.

Pressed for height in the original building, the architects and engineers turned to the high velocity system as a means of saving space. Small size ducts were installed and furred into place, lining up with the window soffit. Velocity of 3000 fpm at the fan . . . with 3" static pressure in the supply plenum . . . called for use of Barber-Colman's unique Uni-Flo Air Valves in back of each outlet. The result — highly efficient air distribution at a remarkably low noise level — led to flat specifications of Barber-Colman equipment for the new addition.

One unique feature of the original installation was the use of Uni-Flo Air Valves to balance air quantities supplied to different zones. The contractor reports the innovation simplified balancing operations, thus saving on cost.

To be in the know on fast-growing high velocity systems . . . and their application to new or old buildings . . . call your nearby Barber-Colman field office for complete details. Or send coupon below for new booklet "High Velocity Air Distribution."



(Above) **Ductwork** before installation of partitions or metal lath ceilings. Complete job required 340 Air Valves, 12 High Velocity Control Units, 207 Sidewall Diffusers and Return Grilles, 10 Air-turns. (Right) **Air Valve** and Diffuser go into place. Valve is adjusted quickly and easily with key through face of Uni-Flo Double Deflection Sidewall Diffuser.

(Above) **Meeting room** is free from disturbing air noise, yet has ample, efficiently diffused air supply for participants in group discussions. (Below) **In addressograph room,** normal air flow is distributed effectively through attractive Uni-Flo Ceiling Diffusers (individually adjustable).

BARBER COLMAN

"UNI-FLO" ENGINEERED

# Air Distribution

Air Distribution Products • Automatic Controls • Industrial Instruments
Aircraft Controls • Small Motors • OVERdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

BARBER-COLMAN COMPANY, ROCKFORD, ILL., U. S. A.
Dept. H, 1102 Rock St. • Field offices in principal cities
☐ Send free booklet "High Velocity Air Distribution" F-5772, with performance and descriptive data.

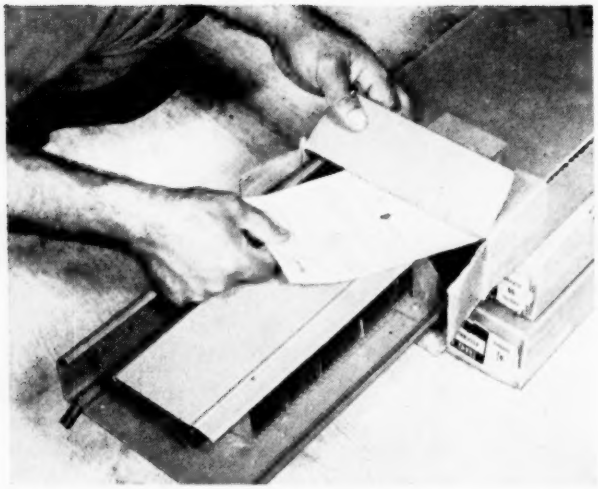
Name _____

Firm Name _____

Address _____

City _____ State _____

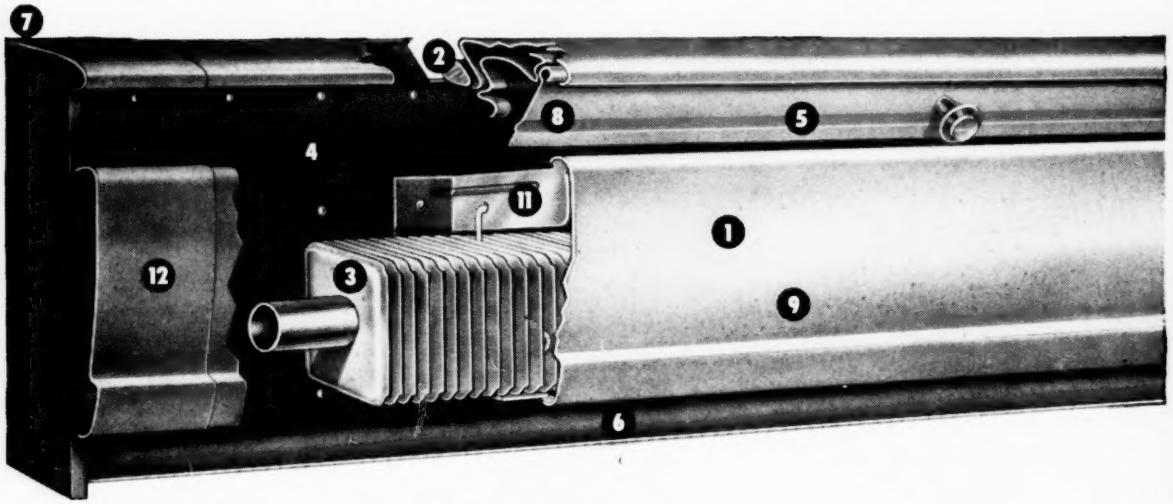
# Save hours on the job with Trane Baseboard



**1. Remove assembly from package!** Basic Baseboard Convector unit comes *assembled* in *one package!* Just slip it out. No parts sorting. Cuts handling time ⅓. Installation instructions in carton.

**2. Mount back plate in one piece!** No leveling. Mounting holes are factory drilled (on 1½" centers). Fin-and-tube element hangs freely within the cabinet . . . is factory installed.

THE NEWEST ADDITION TO THE NATION'S No. 1 LINE OF MODERN RADIATION . . .



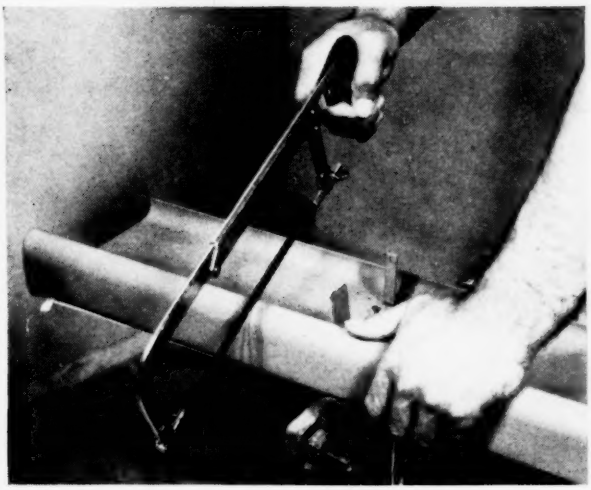

***You can save labor and shave costs with this***

# beautiful new TRANE

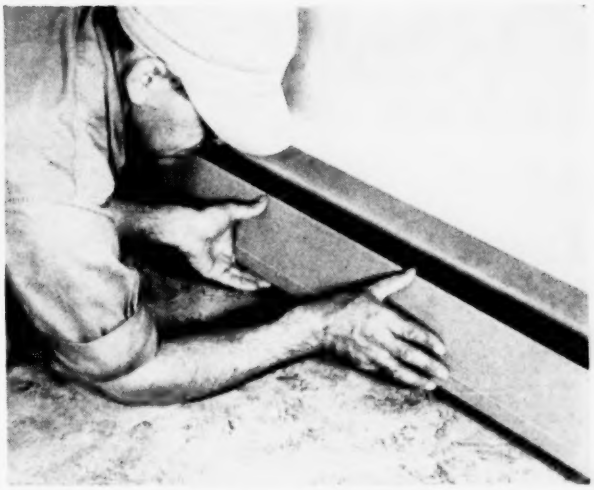
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

# new

# Convectors! Here's how...



**3. Trim to fit any job dimensions!** No complicated fitting. Only two cabinet parts to measure and cut. Back plate and front panel are roll-formed and contoured for extra strength and beauty.



**4. Snap on front, joiners, corners!** No special tools, no sheet metal screws. Snap-on joiners, end pieces, corners cover all metal edges. Even the damper snaps in. Helps cut installation time in half.

## Installs easier because it's built better . . . 12 ways

1. Snap-on front—no sheet metal screws, no sheet metal drilling
2. Full-length back-to-wall rubber seal—prevents dirt seepage
3. Famous **TRANE** fin-and-tube—aluminum fin, copper tube, mechanically bonded
4. One-piece back and top—minimum parts quickly installed, mounting holes provided
5. Uninterrupted outlet—blends unit into wall . . . prevents dirt patterns
6. Reverse radius at bottom—eliminates quarter round, speeds installation
7. Universal unit—free-standing or semi-recessed . . . 2 heights, 2 capacities
8. Snap-in damper—no screws, hinges, levers or chains
9. All parts roll and die-formed—to assure quick, accurate assembly
10. Snap-on joiner pieces—fit tightly, completely cover joints
11. Coil hanger—allows free expansion, designed to end noise
12. End caps—feature snap-on fronts for easy accessibility

TRANE CONVECTORS

TRANE WALL-FIN

# Baseboard Convector

For complete information on capacities, roughing-in dimensions, control diagrams, see your nearby TRANE office or write TRANE, La Crosse, Wis.

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 87 U. S. and 14 Canadian Offices

# FAR-AIR*

## grease eliminators make my kitchen safer! cleaner!

HERE'S WHAT THEY CAN DO FOR YOUR KITCHEN!

Far-Air Grease Eliminators trap grease before it builds up in ventilating ducts to create dangerous fire hazards. Your kitchen will have better ventilation and sanitation for increased customer goodwill and personnel comfort. Its appearance will be improved because Far-Air Grease Eliminators are available in a variety of finishes to match existing equipment.

Expensive periodic duct cleaning is virtually eliminated because Far-Air Grease filters are easy to clean – simply detach from frame and flush with hose or run through dishwasher.

HERE'S WHY FAR-AIR FILTERS ARE MORE EFFICIENT!

Far-Air's exclusive herringbone-crimp media construction provides more efficient grease elimination, 50% more ventilation and assures a longer service period between cleanings.

Farr Engineers are available to help you with your filtration problem, show you how FAR-AIR Grease Eliminators can make *your* kitchen safer and cleaner. Fill out handy coupon below, mail today!

**Other FAR-AIR equipment includes:**
**Standard commercial and industrial panel filters**
**Marine filters • Rotary coolers**
**Filter maintenance equipment**
**Special filters for special applications**

*Trade Mark Reg

FAR-AIR FILTERS
"Better by Farr"

**FARR COMPANY**
*Manufacturing Engineers*
CHICAGO · LOS ANGELES · NEW YORK
Mf'd under license by Control Equipment Co., Ltd.
Montreal, Canada

Farr Company, P. O. Box 10187 Airport Station,
Los Angeles 45, California
Please send me information on FAR-AIR Grease Eliminators. I would ☐ would not ☐ like a Farr Field Engineer to discuss my air filtration problem with me.

Name _____ Title _____

Company _____

Address _____

# PERFORMANCE RATED.....for Long Lived ECONOMY

## SUPERIOR STEAM GENERATORS

. . . are built to maintain full capacity operation at highest efficiencies throughout a longer serviceable life. Their full 5 sq. ft. of heating surface per b.h.p. provides maximum heat transfer at normal firing rates, assuring longer life, and eliminating the excessive maintenance and high electrical costs, caused by overfiring boilers with inadequate heat transfer surface.

Superior Steam Generators are rated for actual working performance under ordinary boiler room conditions . . . not on the basis of laboratory tests under ideal conditions.

A steam generator is a long-term investment. In the course of its life, operating savings can far outweigh initial cost. Specify Superior Steam Generators and profit from their operating savings for years to come.

*Superior Steam Generators are fully automatic, burn oil or gas or both . . . 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water. For complete details, write for catalog 519.*

for performance you can **BANK** on

**SUPERIOR COMBUSTION INDUSTRIES INC.**
**TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.**

SUPERIOR STEAM GENERATORS

# New Modular MULTI-VENT® concealed ceiling panels

# COSTS LESS TO INSTALL

## than ordinary air diffusers!

**Yes! That is the big news in commercial, institutional, and industrial air conditioning for 1953.**

Now you can install this superior low velocity pressure displacement type of air distribution for metal pan ceilings at a far *lower* cost than the high velocity injection type.

This is possible because the new MODULAR PANELS are so extremely simple and easily positioned. They can be assembled and installed in a few seconds by hand without the use of tools —a tremendous saving in labor cost!

Distributing air by Multi-Vent's gentle pressure displacement assures perfectly even air motion, and exceptional uniformity and control of room temperatures. The total absence of strong air streams or blow eliminates all the usual sources of draft complaints and permits complete freedom in locating panels and in relocating partitions.

Write today for detailed literature.

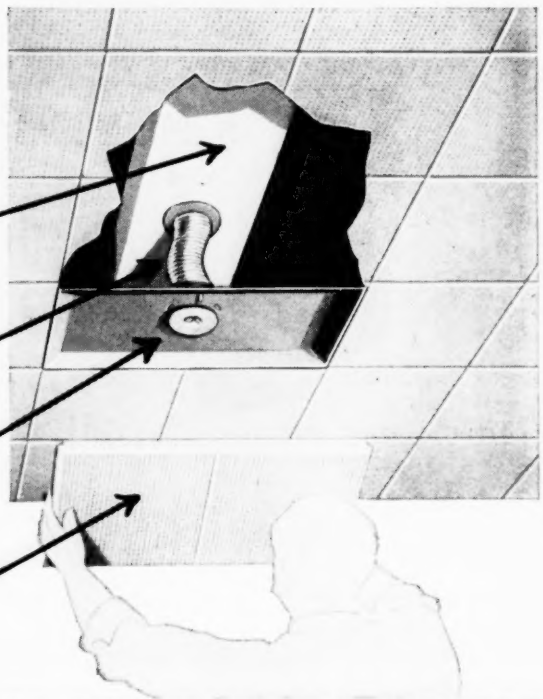
### LABOR SAVING INSTALLATION FEATURES

■ **ADAPTABLE** . . . Duct can be shop built with 3-inch diameter openings at approximate panel locations. Duct work can be installed, flexible tubes with valve snapped in, and system balanced prior to and independent of ceiling erection. Panels can be located without regard to position of lighting fixtures and partitions.

■ **FLEXIBLE** . . . compressible tubing permits wide latitude in alignment, thus radically reduces installation cost by eliminating all need for time consuming close fitting sheet metal work.

■ **ADJUSTABLE** . . . orifice valve can be simply set by wing nut for varied amount of air delivery. Individual panel adjustments do not disturb the overall balance of the system.

■ **COMPLETELY CONCEALED** . . . ANY STANDARD PERFORATED 12" x 24" ACOUSTICAL METAL CEILING PAN (supplied by the ceiling contractor) functions as the distribution plate for the MODULAR MULTI-VENT PANEL. The panel simply replaces the acoustical pad and nests snugly in the pan which snaps into ceiling tee runner, unhampered. Ceiling face is undisturbed.

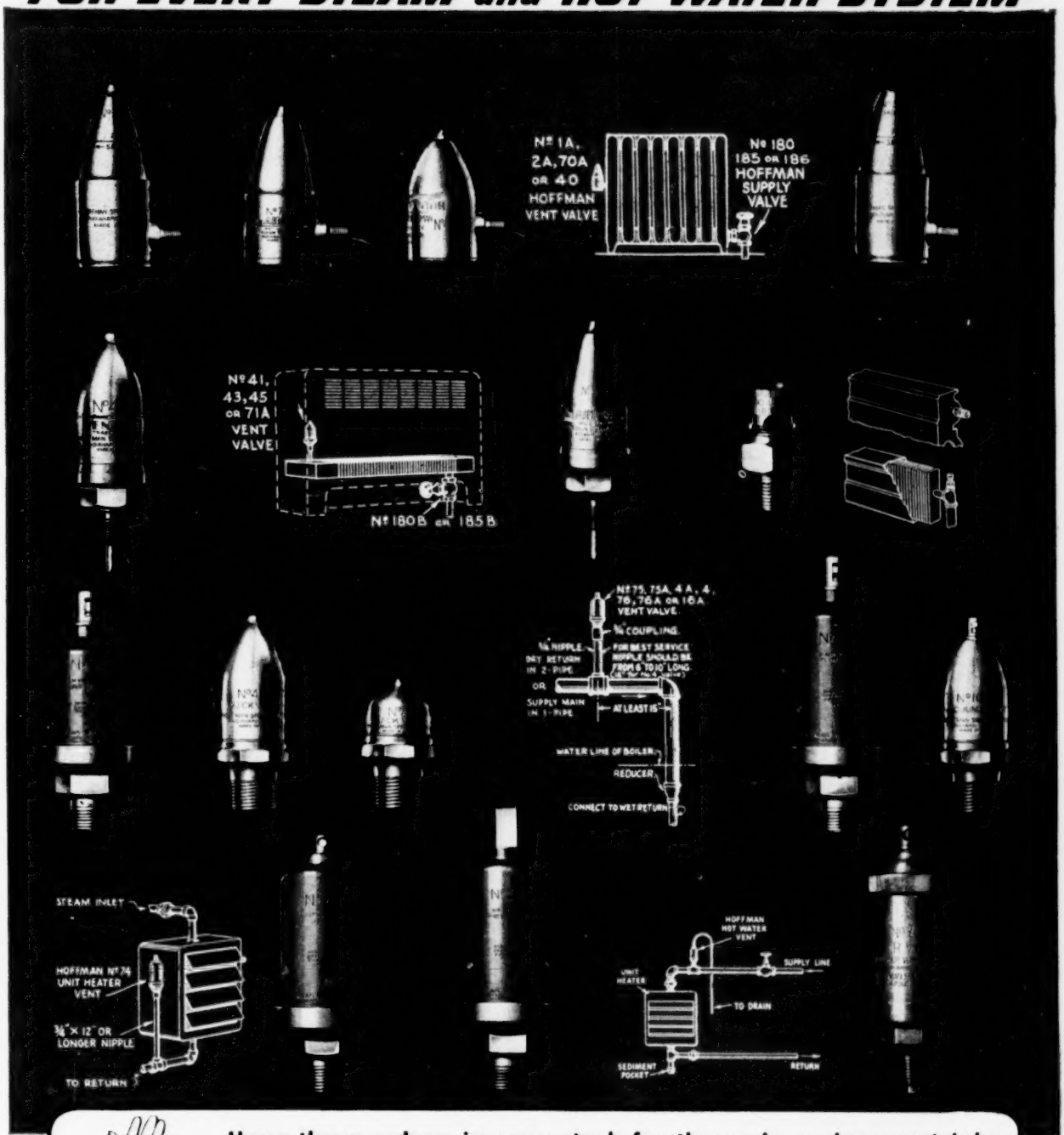


**MULTI-VENT DIVISION** THE PYLE-NATIONAL COMPANY

Sales and Engineering Representatives in Principal Cities of United States and Canada 1374 North Kostner Ave. Chicago 51, Illinois

# HOFFMAN VENTING VALVES

## FOR EVERY STEAM and HOT WATER SYSTEM


Nº 1A, 2A, 70A OR 40 HOFFMAN VENT VALVE
Nº 180 185 OR 186 HOFFMAN SUPPLY VALVE
Nº 41, 43, 45 OR 71A VENT VALVE
Nº 180B OR 185B
Nº 75, 75A, 4A, 4, 78, 76A OR 16A VENT VALVE
¼" COUPLING
¼" NIPPLE
DRY RETURN IN 2-PIPE
OR
SUPPLY MAIN IN 1-PIPE
FOR BEST SERVICE NIPPLE SHOULD BE FROM 6 TO 10" LONG
AT LEAST 18"
WATER LINE OF BOILER
REDUCER
CONNECT TO WET RETURN
STEAM INLET
HOFFMAN Nº 74 UNIT HEATER VENT
¾" × 12" OR LONGER NIPPLE
TO RETURN
HOFFMAN HOT WATER VENT
SUPPLY LINE
UNIT HEATER
TO DRAIN
SEDIMENT POCKET
RETURN

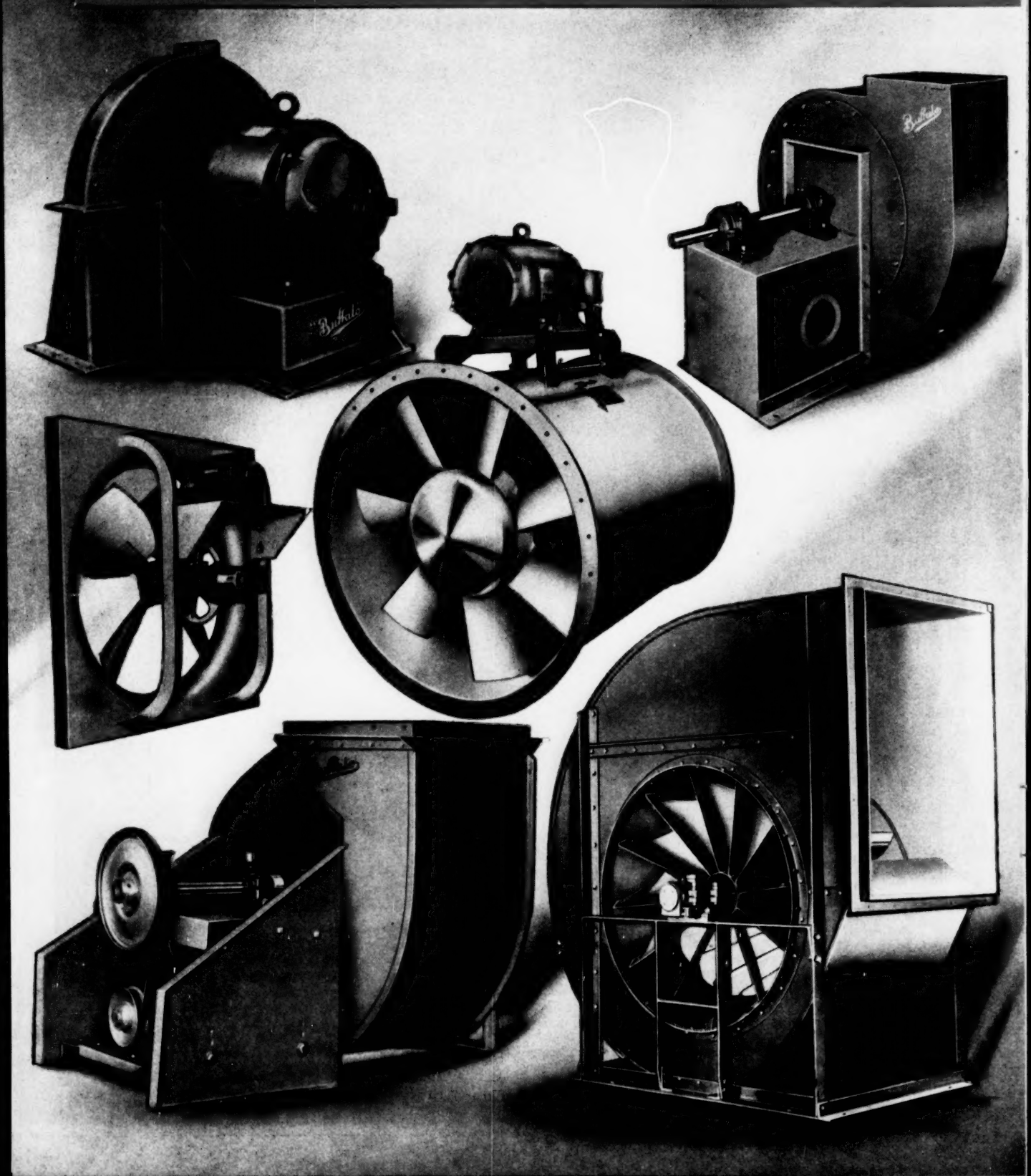
### Have these valves in your stock for the early replacement jobs

For either one-pipe or two-pipe steam, hot water, residential or industrial heating—Hoffman assures you the correct Vent Valve for each specific requirement. Radiator Valves all feature the hinged drainage tongue. For the hard-to-balance radiators, the Hoffman line includes adjustable-port valves, available for vacuum and non-vacuum systems. It is not too early to order adequate stocks of main and radiator vent valves for modernizing jobs. Call your wholesaler.

**HOFFMAN SPECIALTY MFG. CORP. • 1001 York Street, Indianapolis 7, Indiana**

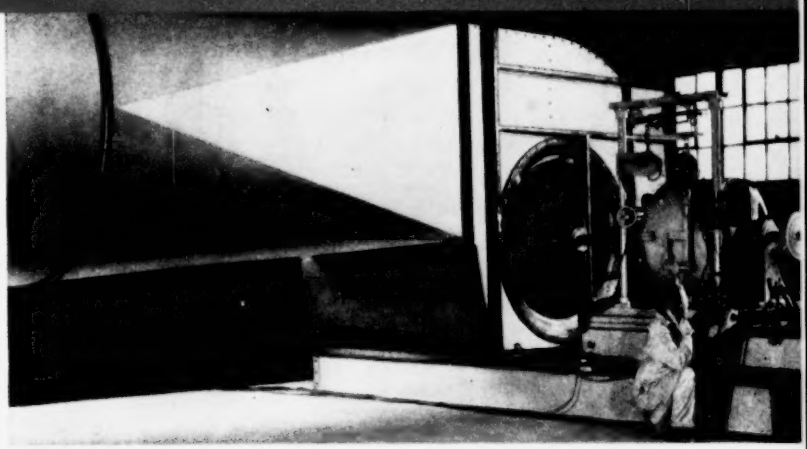
Makers of Valves, Traps, Hot Water Heating Systems, Vacuum and Condensation Pumps . . . Sold by Leading Wholesalers of Heating and Plumbing Equipment

# MAINTENANCE



# DIVIDENDS from

# PROPER FAN SELECTION



*In the "Buffalo" Test Room, engineers put fans thru every conceivable performance test. Continual improvement — better performance — lower fan maintenance costs — are the results. In the above station, thrust, noise, and performance characteristics are checked.*

If you keep records of maintenance costs, you'll already know that first cost can be of minor importance on some equipment.

On fans, for example, over a period of years, maintenance costs can be considerable. We believe, after seventy-six years' experience in air handling, that some of this excessive maintenance cost comes from improper selections of equipment.

"Buffalo" manufactures 20 lines of fans and blowers, for every service from residential kitchen ventilation to sub-zero airplane instrument testing — from 20 CFM to 600,000 CFM. We have, in our engineering files, almost every problem which AIR has been asked to solve.

We have the Engineering organization which produced, in 1914, the first edition of "Fan Engineering", ever since, the Bible of the air industry.

We do not hesitate to say, occasionally, "It cannot be done with present equipment."

Why not capitalize on this accumulated experience? Why not get the benefit of the "Q" Factor* that "Buffalo" builds into the fans, air cleaning and conditioning equipment, which our engineering sales representatives, in principal cities are ready to discuss with you? Their advice is impartial.

No obligation — and no regrets.

** — The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

## BUFFALO FORGE COMPANY

480 Broadway — Buffalo, New York

*PUBLISHERS OF "FAN ENGINEERING" HANDBOOK*

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

FORCED DRAFT PRESSURE BLOWING HEATING COOLING
VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING

# Quick and

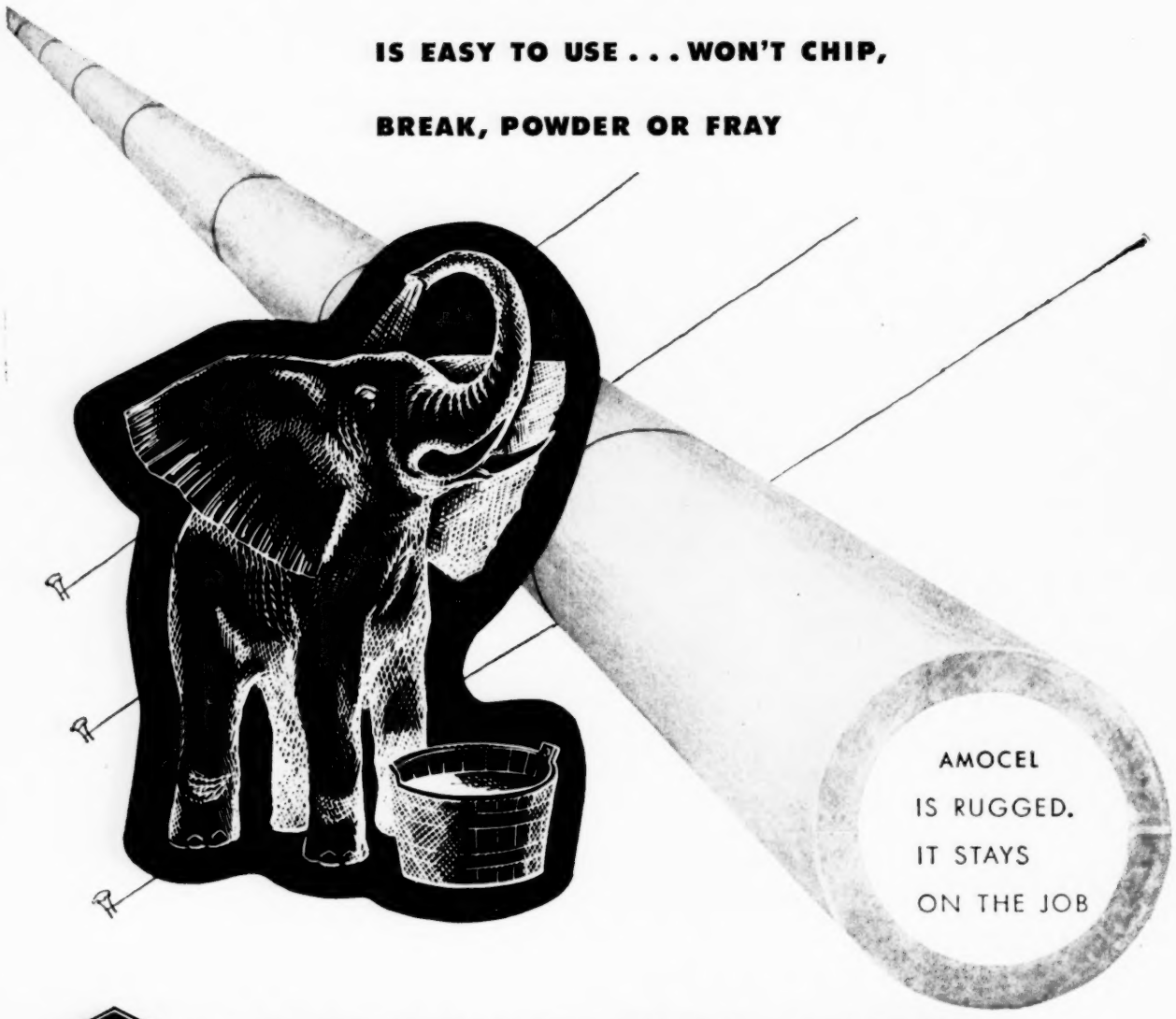
# **clean** to apply

# Amocel®

PIPE INSULATION

**IS EASY TO USE . . . WON'T CHIP,**

**BREAK, POWDER OR FRAY**

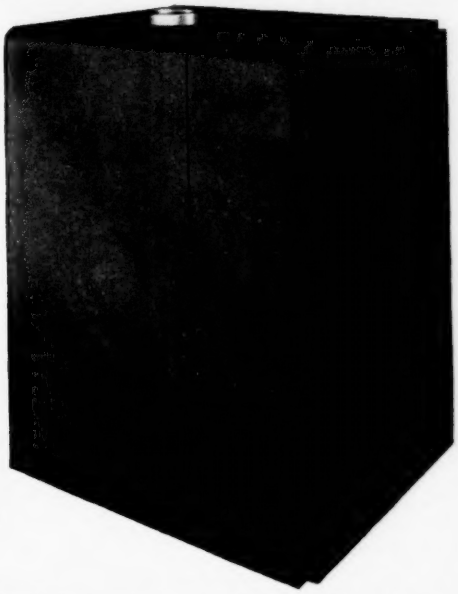



UNARCO **UNION ASBESTOS & RUBBER COMPANY**

DEPT. B-8, 332 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS

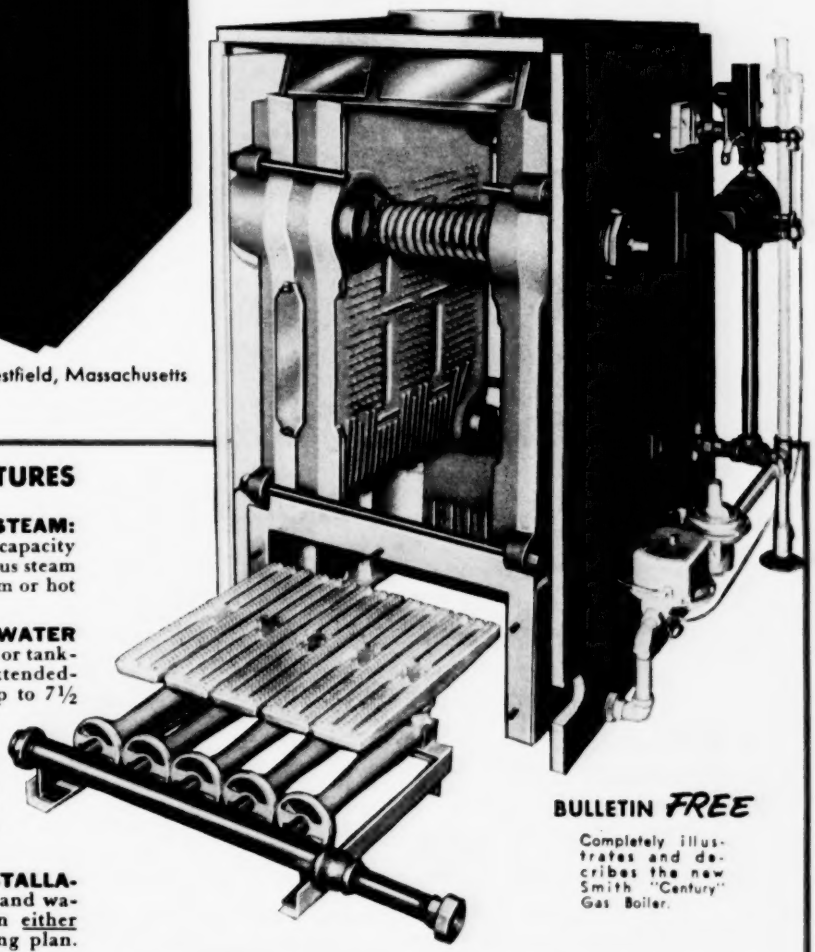
# H.B. New Smith "Century" Gas Boiler

## engineered from the ground up — AGA approved



**Input Ratings from 138,000 Btu to 745,500 Btu**

"Century" is a completely new line of H. B. Smith Boilers, incorporating exclusive developments in gas boiler design. They provide economical, dependable heat (hot water or steam), with ample domestic hot water. Compact, attractive insulated steel jacket in smooth hammer-tone blue! Free Bulletin describes the Smith "Century" in detail.



THE H. B. SMITH CO., INC. • Westfield, Massachusetts

Established 1853

### QUICK REVIEW OF FEATURES

1. **WATER CAPACITY FOR STEAM:** Boiler sections of extra large capacity hold sufficient water for continuous steam generation . . . adaptable for steam or hot water heating.
2. **LARGEST DOMESTIC HOT WATER SUPPLY:** Provides built-in tank or tankless heater with new, compact extended-surface copper coils — insures up to 7½ gals. of hot water per minute.
3. **DURABLE CAST IRON:** Boiler embodies typical rugged Smith construction with cast iron water-tube sections, highly resistant to corrosion. Can be expanded as building grows.
4. **ADAPTABLE FOR ALL INSTALLATIONS:** Gas intake and controls and water connections can be made on either side of boiler, according to piping plan.
5. **REMOVABLE BURNER ASSEMBLY:** For ease in servicing, entire burner assembly is removable by disconnecting one union.
6. **PRECISION-DRILLED RAISED PORTS:** Cast iron burners with precision-drilled raised ports. If debris should fall on burners, it cannot interfere with complete combustion.
7. **SAFETY-PLACED GAS PILOT:** Pilot located at center of burner on intake side insures prompt, smooth ignition of all burner units. No popping.
8. **GAS CONTROLS AND SAFETY DEVICES:** Boiler features the latest AGA approved gas controls and safety devices, conveniently located.
9. **STAINLESS STEEL FLUE COLLECTOR:** Flue collector lined with stainless steel — protects against corrosion.

**BULLETIN FREE**

Completely illustrates and describes the new Smith "Century" Gas Boiler.

**A CENTURY IN '53 -- OUR YEAR OF GREATEST PROGRESS**

H. B. Smith

**CAST IRON BOILERS**

## Good tools + YOUNGSTOWN PIPE = GOOD JOB!

● You really speed along when you work with Youngstown pipe. Reaming is easy and fast because Youngstown Steel Pipe produces a minimum of burrs in cutting. This is because Youngstown is quality steel, chemically and metallurgically right, controlled by one producer—Youngstown—from raw ore to finished product. The name Youngstown, rolled into every length, means GOOD PIPE.

7 POINTS OF UNIFORM GOODNESS IN YOUNGSTOWN STEEL PIPE

UNIFORM

- ductility
- lengths
- threading
- weldability
- wall thickness and size
- strength and toughness
- roundness and straightness

QUALITY YOUNGSTOWN SERVICE

# Youngstown STEEL PIPE

**THE YOUNGSTOWN SHEET AND TUBE COMPANY** *Manufacturers of Carbon, Alloy and Yoloy Steel*

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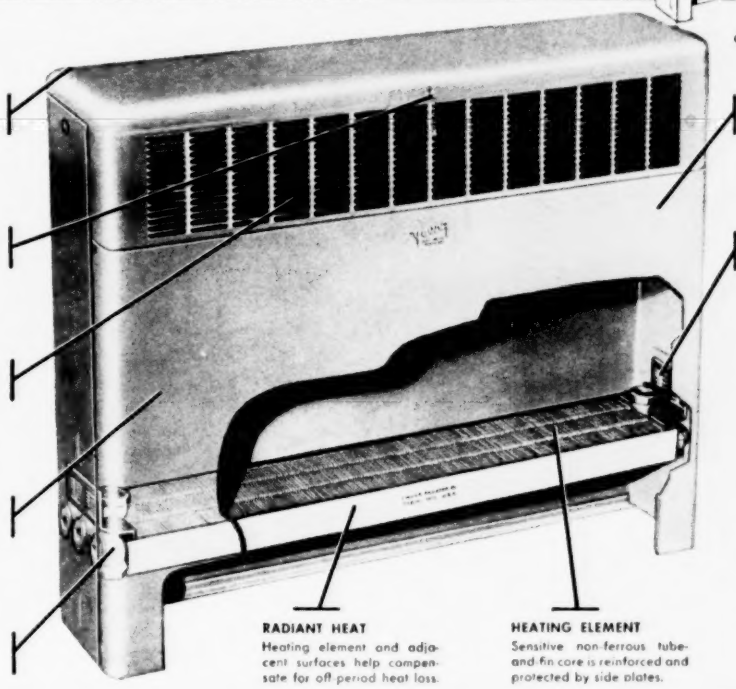
PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES

# *There's More than Meets the Eye in* YOUNG *CONVECTORS*

**Take a look inside a Young Convector. Right away, you'll see many "hidden values" in Convector design features and construction quality. Such built-in value places Young Convectors in a class above the ordinary . . . assures easy installation, heating comfort and economy.**



**AIR SEAL**
Strips of felt and/or corner gaskets prevent air leaks and resultant wall streaking.

**DAMPER CONTROL**
Chain control regulates damper and rate of air flow thru cabinet and heating element.

**OVER-SIZE GRILLE**
Louvers direct air outward and permit abundant heat delivery . . . greater capacity.

**MODERN CABINET**
Finished in prime coat . . . can be painted to match decor . . . safe, rounded corners.

**SIMPLIFIED PIPING**
Cabinet knock-outs and header casting design permit piping from top and bottom.

**RADIANT HEAT**
Heating element and adjacent surfaces help compensate for off-period heat loss.

**HEATING ELEMENT**
Sensitive non-ferrous tube-and-fin core is reinforced and protected by side plates.

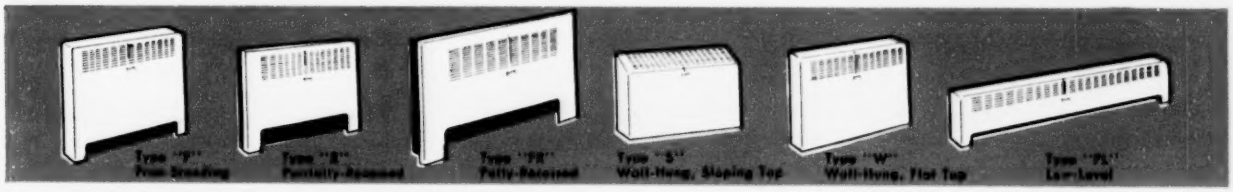
**EASY TO CLEAN**
One piece front panel is easily removed for seasonal cleaning.

**SIMPLIFIED HEATING ELEMENT SUPPORTS**
Provide quick installation and pitching adjustments. Hold heating element securely.

**PACKAGED FOR PROTECTION**
Reinforced, stapled cartons protect convectors. Marked for easy identification.

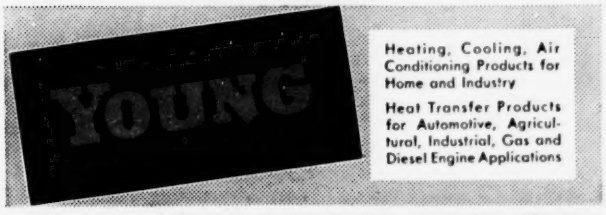
**STANDARD RATINGS**
The ratings of Young Convectors have been determined in conformance with Commercial Standard CS 140-47, as developed cooperatively by the trade and the National Bureau of Standards, U. S. Department of Commerce, and the said ratings have been approved by the Convector Rating Committee.

Whether you specify or install heating equipment, you'll be way ahead with Young Convectors. Only Young offers all the design features shown above. Young supplies Convectors at low initial cost, with six standard types available from stock to meet early delivery dates. Remember, too, every Young Convector has been rated and approved in conformance with Commercial Standard CS140-47. These advantages all add up to greater convenience for you . . . greater satisfaction for your clients or customers. For further details, see nearest Young Representative or write for catalog.




## YOUNG RADIATOR COMPANY

Dept. 523-H, Racine, Wisconsin
Plants at Racine, Wisconsin and Mattoon, Illinois
Sales and Engineering Representatives in All Principal Cities




Heating, Cooling, Air Conditioning Products for Home and Industry

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Applications

***Leaders in Heat Transfer Engineering for more than 25 years***

## CONTRACTORS

All Young Convectors are packaged in clearly marked, reinforced cartons for unit protection and ease in identification on the job. Adjustable support (see above) also holds heating element rigidly in place and permits shipping element in cabinet for quicker installation.

# *BIG* sales-push for hot water heating is coming your way!

**American-Standard starts the push with this ad in the September 21st issue of**

**LIFE**

DON'T FREEZE NEXT WINTER!
Modernize your old heating system now... install an
American-Standard Boiler
for hot water heating at its best
Pay as little as $1.76 a week*
EASY TO INSTALL IN NEW OR OLD HOMES
Ask your American-Standard retailer to show you the magic of hot water heating
NEW BASEBOARD HEATING PANELS
AMERICAN-Standard
HEATING

## *Be ready to present the sales-closing story on the Magic of Hot Water Comfort*

NOW is the time to put extra effort into selling hot water heating equipment, *before* the chill of winter forces your prospective customers to get heating equipment in a hurry.

American-Standard is ready to help you, with this biggest of all heating promotions.

For the first time, a major manufacturer is utilizing the full impact of LIFE magazine in a special drive to urge homeowners to modernize their heating systems, with American-Standard hot water heating equipment. And they are invited to see their American-Standard retailer for information on the magic of hot water comfort. Don't miss this chance to boost *your* sales. Stock up now with American-Standard boilers and baseboard heating panels.

**American Radiator & Standard Sanitary Corporation**
**P. O. Box 1226, Pittsburgh 30, Pa.**

### SALES AIDS AVAILABLE

It's easy to tie-in with this big LIFE promotion . . . American-Standard has prepared a special sales-making promotion kit to help you. It includes a Display Unit, Direct Mail Package, eye-catching Window Streamer, LIFE tie-in Counter Card and Wall Poster, and a "Selling" Booklet—over $20.00 worth of material for only $10.00! Contact your heating distributor or your American-Standard sales office for your order.

**AMERICAN-Standard**
**HEATING**

*Serving home and industry:* AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

**American Blower – a time-honored name in air handling**

It takes only a few minutes to learn how much better your heating can be with American Blower Unit Heaters.

And, for years after you install them, you'll get the benefits of their lower fuel costs, lower maintenance costs and exceptionally long life.

Heavy duty coils, unobstructed outlets for maximum heat diffusion, completely enclosed moving parts are but a few of the quality features which make these units outstanding. They carry Certified Ratings—and are sound-rated, too.

For data, phone the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

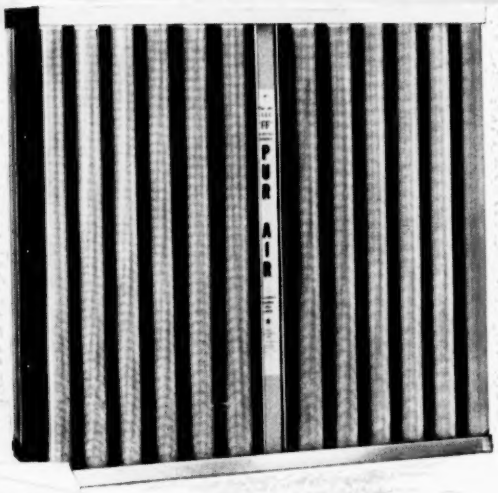
# AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

*Serving home and industry*

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

# Remove Odors with *Pur Air* Adsorbers




## completely adaptable . . .

## easily installed in any system

Using the proved principle of the gas mask, adsorption by activated carbon, Pur Air equipment will positively remove odors. A faint smell of violets or a deadly concentration of chlorpicrin gas . . . either is absorbed and retained by Pur Air activated, coconut-shell carbon.

The Pur Air Filter-Fold unit above can be used singly or in combination to fit the system. Accordian-like construction provides maximum adsorbing surface. Since the amount of carbon determines effective life, it is important to know this unit contains 44 lbs. of guaranteed 50-minute, activated, coconut-shell carbon. Tests of over 15,000 materials proved that to be the best for odor and gas adsorption.

Wherever you encounter an odor problem, you can profit by the help of a Pur Air engineer. Call him in without obligation. Seventy sales offices are at your service.

## *Pur Air*, self-contained odor-removal units

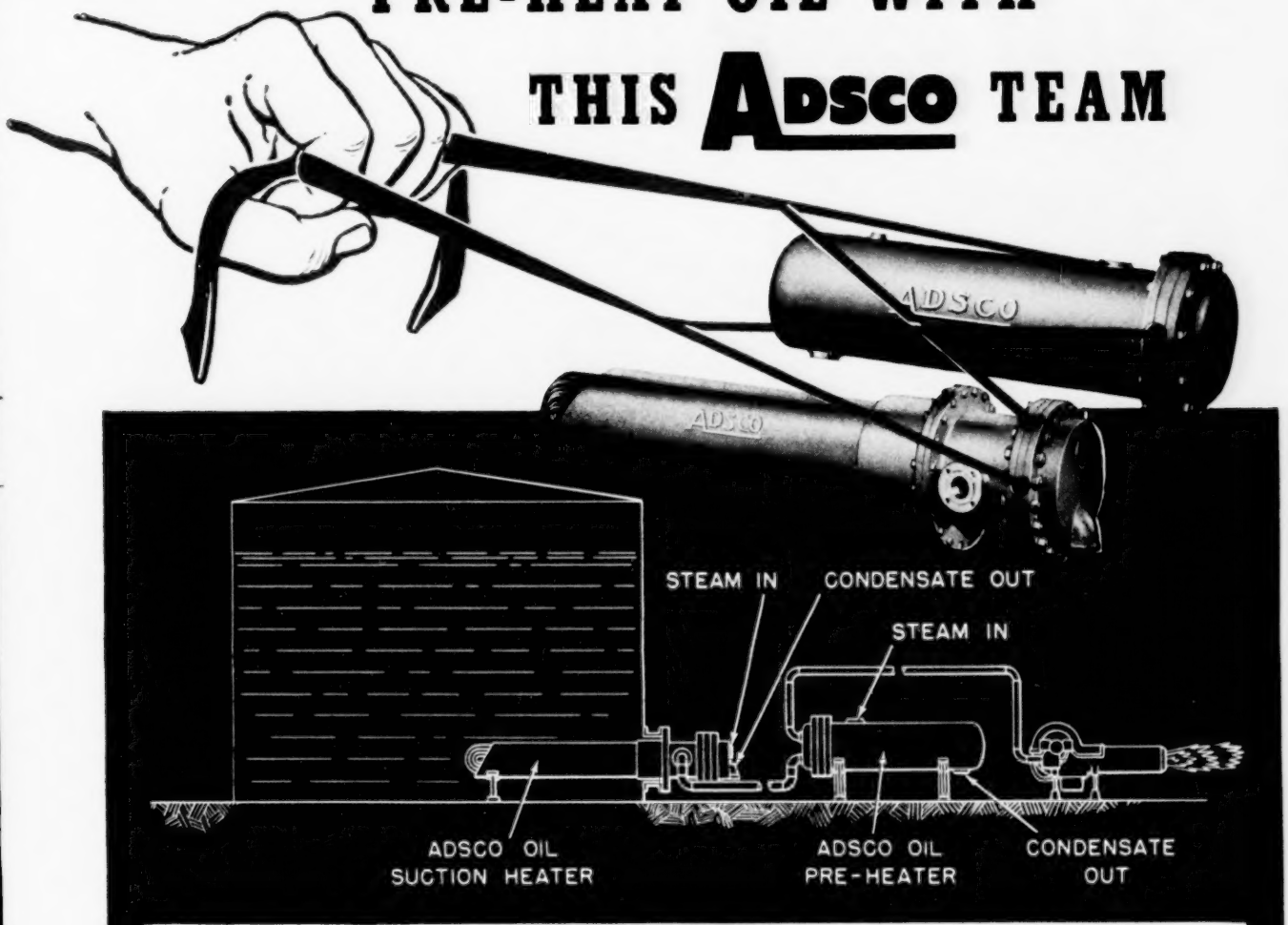
Shown at left are several Pur Air units that are ready to plug in and start removing odors. There are sizes for any enclosed area . . . small lavatories, large warehouses, taverns, restaurants, hospital rooms, kennels, homes, offices, and a hundred others. Give us an idea as to the size area with the odor problem and we'll give you data about the Pur Air unit to correct it.

*Pur Air* DIVISION
**BARNEBEY-CHENEY** *Company*
MANUFACTURERS OF ACTIVATED CARBONS

**N. Cassady and Eighth Aves., Columbus 19, Ohio**

***SOLVENT RECOVERY DIVISION: Complete Solvent Recovery Systems***

# PRE-HEAT OIL WITH THIS ADSCO TEAM




▶ Two important jobs to be done in a fuel oil system are warming the fuel oil in the storage tank so it will move easily through the pipes and then pre-heating it for thorough atomization in the burner. These two jobs are done well with an ADSCO Oil Suction Heater and an ADSCO Oil Pre-Heater. The suction type heater is the modern, efficient method of reducing the viscosity of heavy oil so that it can be pumped economically. Instead of raising the temperature of all the oil by old-fashioned pipe coils on the bottom of the tank, only the oil to be pumped is heated. This eliminates excessive waste of steam by tank radiation losses. ADSCO Pre-Heaters assist in obtaining the highest performance from heating oil by preparing it properly for complete combustion in the burner. In many cases, the work done by ADSCO Oil Suction Heaters and Oil Pre-Heaters permits the use of a lower-grade, less costly fuel oil... For more details, call your ADSCO representative or write the factory. ADSCO Oil Suction Heaters and ADSCO Oil Pre-Heaters are made in many sizes with different metal combinations for shell and tubes. They are manufactured with the same insistence on quality which distinguishes all ADSCO products. ADSCO'S engineering staff is available for work on all types of special heat transfer problems. All recommendations are based on many years of practical experience.

ADSCO ENGINEERED PRODUCTS

EXPANSION JOINTS • HEAT EXCHANGERS • STEAM TRAPS
STRAINERS • SEPARATORS • METERS

## AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA, NEW YORK

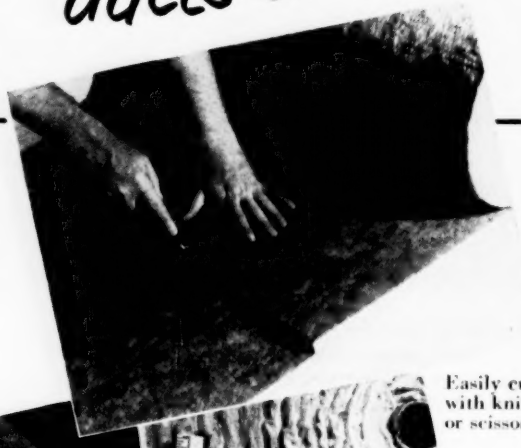
*Since 1877*

Flexible MICROLITE blanket conforms readily to irregular shapes.

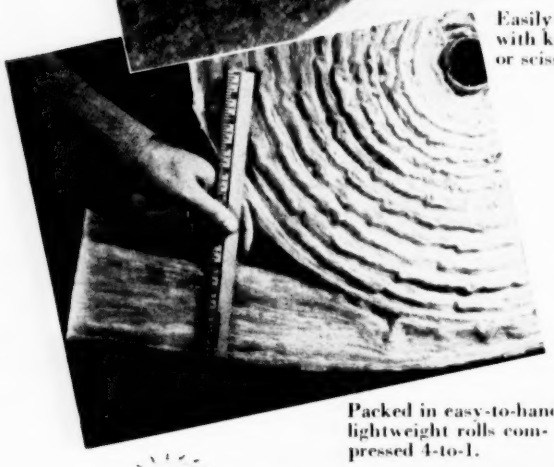
Extremely light in weight with good tensile strength for easy handling in large sections, even overhead.

# When you've got ducts to wrap...

## You'll save time— You'll do it easiest— with MICROLITE



Easily cut with knife or scissors.



Packed in easy-to-handle, lightweight rolls compressed 4-to-1.

**MICROLITE** ***Glass Fiber Insulating Wool*** is a natural for wrapping ducts. It's soft—it's resilient—it's pleasant to handle—it's easy to cut.

Extreme light weight of Microlite minimizes attachment and mounting points—without danger of insulation sag. Weighing only ½-pound per cubic foot, enough B-305 Microlite to provide 1″ of insulation on a 1′ x 2′ x 100′ duct weighs only 50 pounds.

Inch for inch, Microlite is one of the most effective of all insulating materials. Half-pound density Microlite has a "k" factor of .25 at 50° mean; a Noise Reduction Coefficient for 1″ thickness of .60. You can't conscientiously proceed with any insulating job until you've investigated Microlite, a product of Glass Fibers exclusive electronic-extrusion process. Write for descriptive Microlite brochure and detailed duct application manual. Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

# GLASS FIBERS INC.

*Makers of glass fibers by the ELECTRONIC-EXTRUSION process—developed, patented and used exclusively by Glass Fibers Inc.*

VITRON Yarns • Rovings • Micro-Fibers • Pipe Wraps • Industrial Mats • MICROLITE Thermal and Acoustical Insulation
DURAMAT Vapor Barriers • VIBRAGLASS Mounting and Packaging Materials • COUSTIC-AIRE and THERMO-JET Aircraft Insulations.

# McQuay Heating Coils bear up under severe conditions!

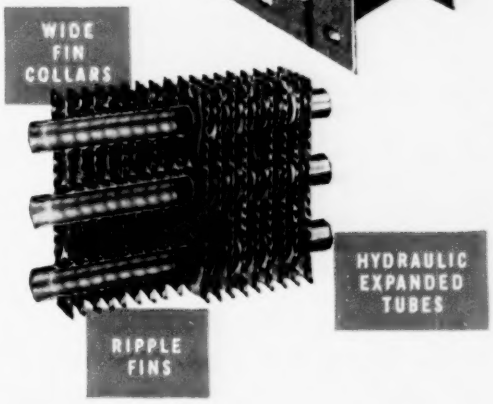
Minnesota, home of McQuay, is America's headquarters for four distinct and glorious seasons. To many, Minnesota's powerful black bears have the right idea—to hibernate during the rugged sub-zero winters.

By specifying McQuay equipment, you can assure your customers that there will be no need for them to go into hibernation or to migrate to the south.

Ripple Fin coil construction, an exclusive McQuay feature, is the product of years of research aimed at producing the ultimate in heat transfer for any weight metal. High efficiency is assured by forcing the air to follow an ever-changing direction of flow in passing through the coil. Thus the air repeatedly contacts the coil surface to give maximum contact time, maximum contact velocity, and a resultant optimum heat transfer.

The staggered tube and rippled edge features also contribute greatly to the construction ruggedness of the famous McQuay line.

McQuay heating coils are available in a wide variety of styles and sizes. Hot water, cold water, brine, direct expansion, and refrigerant condensing coils are available for practically every type of application. Write McQuay Inc., 1619 Broadway St. N.E., Minneapolis 13, Minnesota. Representatives in principal cities.

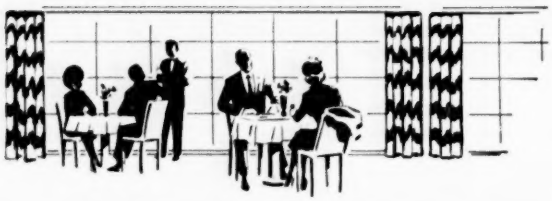



McQuay INC.

HEATING • AIR CONDITIONING • REFRIGERATION

N E S W

MAKE THE SEASONS COME TO YOU



## OVERCOME WATER PROBLEMS WITH *NEW* AIR-COOLED AIR CONDITIONER!

Chrysler Airtemp has the answer for air conditioning jobs where water is hard to get . . . where distance makes piping costs prohibitive . . . where water pressure is low . . . or where the water is very hard or corrosive. It's the new Chrysler Airtemp Air-Cooled "Packaged" Air Conditioner! But that's only a few of the advantages!

- Since Chrysler Airtemp Air-Cooled "Packaged" Air Conditioner *doesn't use water* . . . it costs less to install!
- The new, small-space Chrysler Airtemp compressor is light in weight and so quiet it can be located inside the conditioned area. It's efficient and dependable.
- The new Air-Cooled "Packaged" Air Conditioner is available in 2 and 3 h.p. capacity.

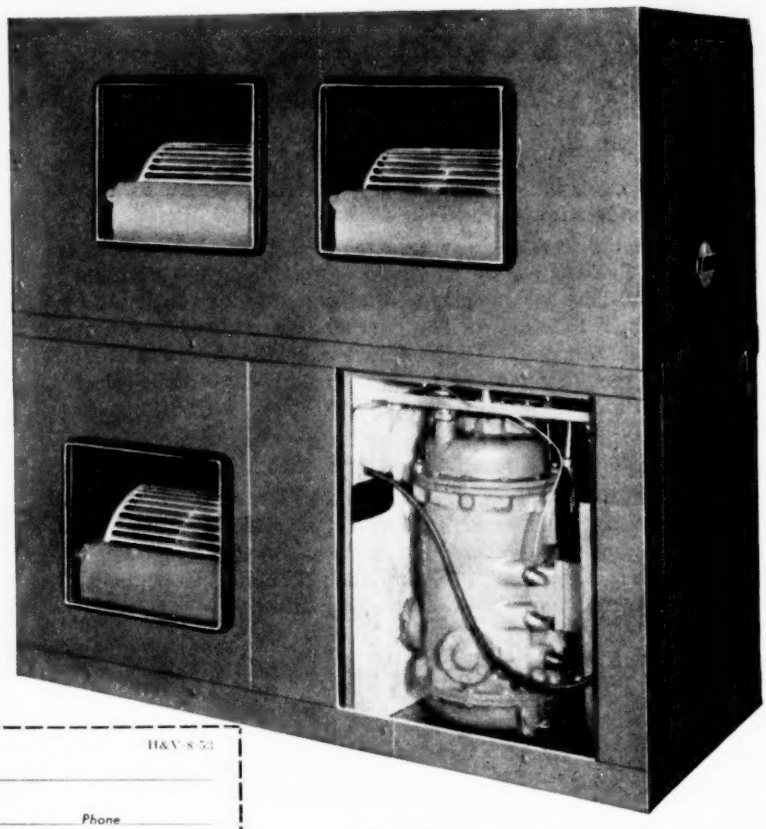
Send the coupon today for all the facts. Sell the "Packaged" Air Conditioning most people buy . . . Chrysler Airtemp!

*Comfort Zone* FOR PROFIT

Guaranteed by Good Housekeeping

*Chrysler Airtemp*

**HEATING • AIR CONDITIONING**
***for* HOMES, BUSINESS, INDUSTRY**
**Airtemp Division, Chrysler Corporation**
**Dayton 1, Ohio**



New Air-Cooled 3 H. P.
"Packaged" Air Conditioner

H&V-8-53

**Airtemp Division**
**Chrysler Corporation**
**P.O. Box 1037**
**Dayton 1, Ohio**

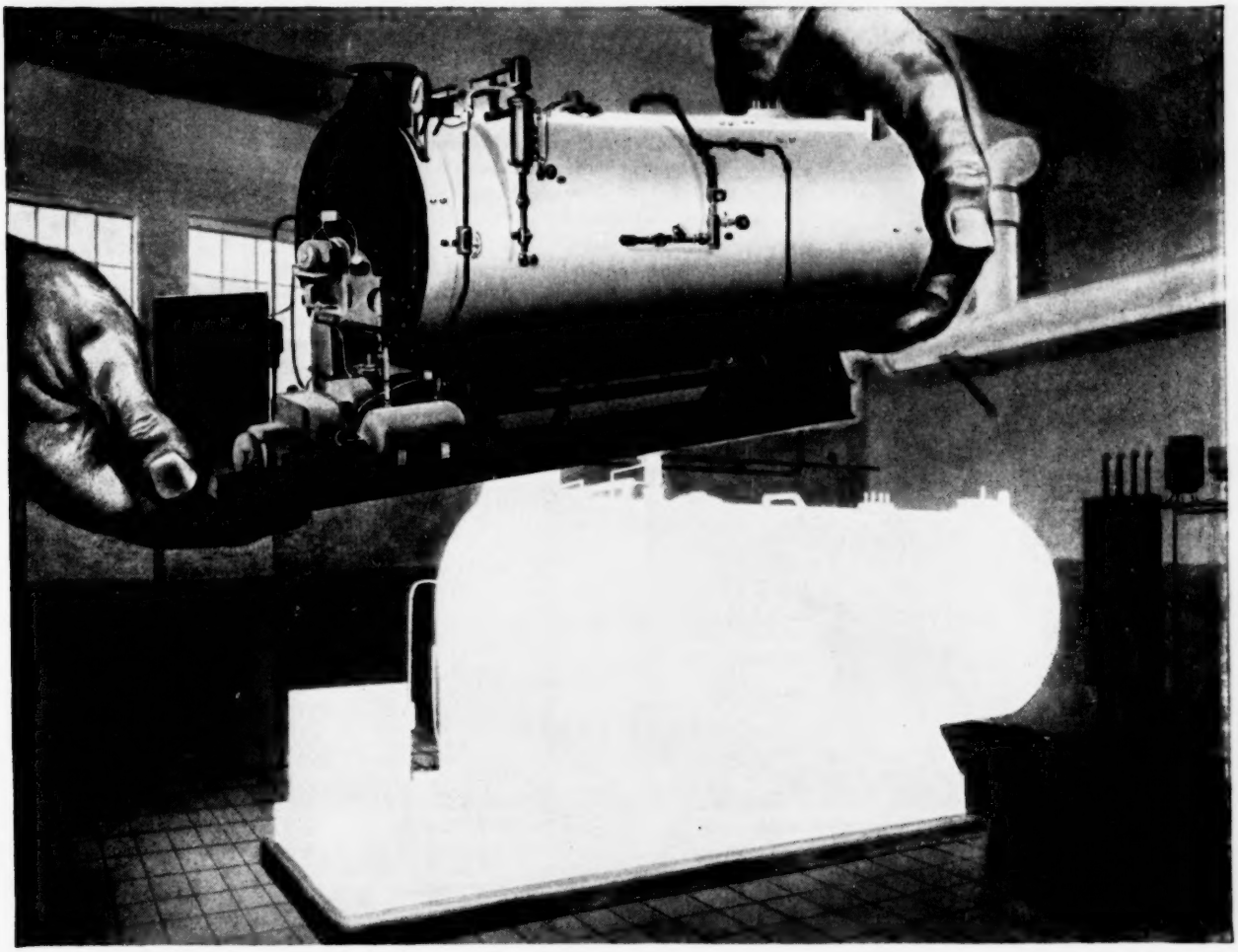
Please send full details on the Chrysler Airtemp Comfort Zone "Packaged" Air Conditioning proposition.

Name _____

Address _____ Phone _____

City _____ Zone ____ State _____

# Here's why you get more...when you buy a Cleaver-Brooks Self-Contained Boiler



## ...only Cleaver-Brooks can offer you the experience gained from more than 20 years of pioneering . . . and more than 12,000 individual "packaged" boiler installations

CLEAVER-BROOKS pioneering has been largely responsible for simplifying boiler buying . . . lowering costs of installation . . . delivering 80% guaranteed steam efficiency from every fuel dollar.

Boilers can be shipped as completely assembled and tested self-contained units, with auxiliaries as required. Installation involves minimum of time, construction and space. Usually connections only to steam, fuel, water lines and electrical service are needed. No special foundations are required. A short vent takes care of exhaust gases. Frequently, boilers are ready for use in a matter of *hours*, depending on availability of service lines.

Cleaver-Brooks, originators of the self-contained boiler, offers wider experience that counts in another important way. Qualified engineers help you plan steam plants tailored *exactly* for your needs. Carefully analyzed are loads, space and equipment arrangement. This not only helps you solve present steam needs, but adds flexibility for future expansion as well.

This application engineering, plus basically sound design and construction is your assurance of a full return from your boiler investment. When you specify a self-contained boiler — make sure it's a Cleaver-Brooks.

*Cleaver-Brooks steam or hot water boilers for heating and processing are available for oil, gas or combination oil/gas firing. Sizes: 15 to 500 hp. 15 to 250 psi. Write for Catalog AD-100.*

**CLEAVER-BROOKS COMPANY**
Dept. J, 315 E. Keefe Ave.
Milwaukee 12, Wisconsin, U.S.A.

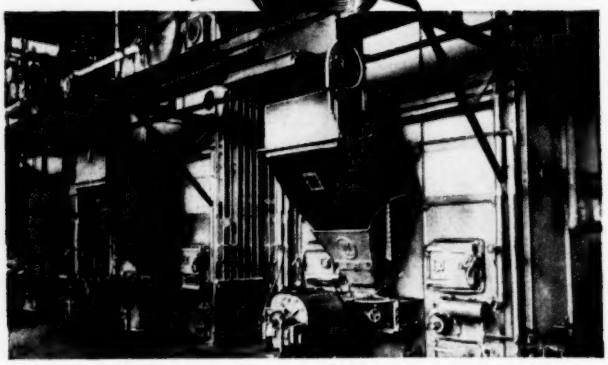
**Cleaver-Brooks**
**ORIGINATORS OF THE SELF-CONTAINED BOILER**
Steam Boilers • Oil and Bitumin Tank Car Heaters • Distillation Equipment
Oil and Gas Fired Conversion Burners

# "Orchids to Oppenheimer!

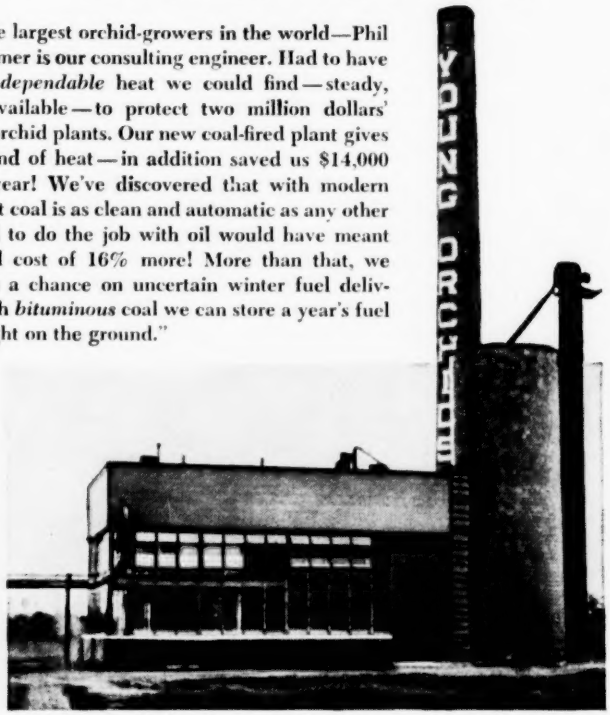
## THAT NEW COAL HEATING SYSTEM HE DESIGNED SAVED $14,000 THE FIRST YEAR!"

**says Carl R. Beckert, President, Thomas Young Orchids, Inc., Bound Brook, N. J.**

"We're the largest orchid-growers in the world—Phil Oppenheimer is our consulting engineer. Had to have the most *dependable* heat we could find—steady, quickly available—to protect two million dollars' worth of orchid plants. Our new coal-fired plant gives us that kind of heat—in addition saved us $14,000 the first year! We've discovered that with modern equipment coal is as clean and automatic as any other fuel—and to do the job with oil would have meant an overall cost of 16% more! More than that, we can't take a chance on uncertain winter fuel deliveries. With *bituminous* coal we can store a year's fuel supply right on the ground."



The firing aisle at the new plant. This highly efficient coal equipment cut the company's fuel costs by 23%—is so completely automatic that it saved $6,000 the first year on labor costs, too!



This 300-ton silo that Young installed does away with former handling and shovelling costs. Coal is fed from the silo by a screw conveyor to each boiler's stoker-hopper—the coal is weighed on its trip.

- Use coal now? Get ALL coal's economy with highly efficient modern equipment. Building a new power plant? Find out how much more economical, efficient a job *bituminous* coal can do. Call in a competent consulting engineer. He can show you the modern coal-handling and combustion installations that will save most while meeting your particular needs. Remember you can count on *bituminous* coal! Of America's total fuel reserve—92% is coal! Even today oil is *imported*—while America can and does *export* coal! Ample coal reserves plus the outstanding efficiency of America's mining companies give coal users *the greatest possible assurance of a dependable fuel supply at stable prices.*

**If you're running your own steam plant, here are just a few down-to-earth facts you can't afford to ignore!**

**COAL** in most places is today's most economical fuel.

**COAL** resources in America are adequate for all needs—for hundreds of years to come.

**COAL** production in the U.S.A. is highly mechanized and by far the most efficient in the world.

**COAL** prices will therefore remain the most stable of all fuels.

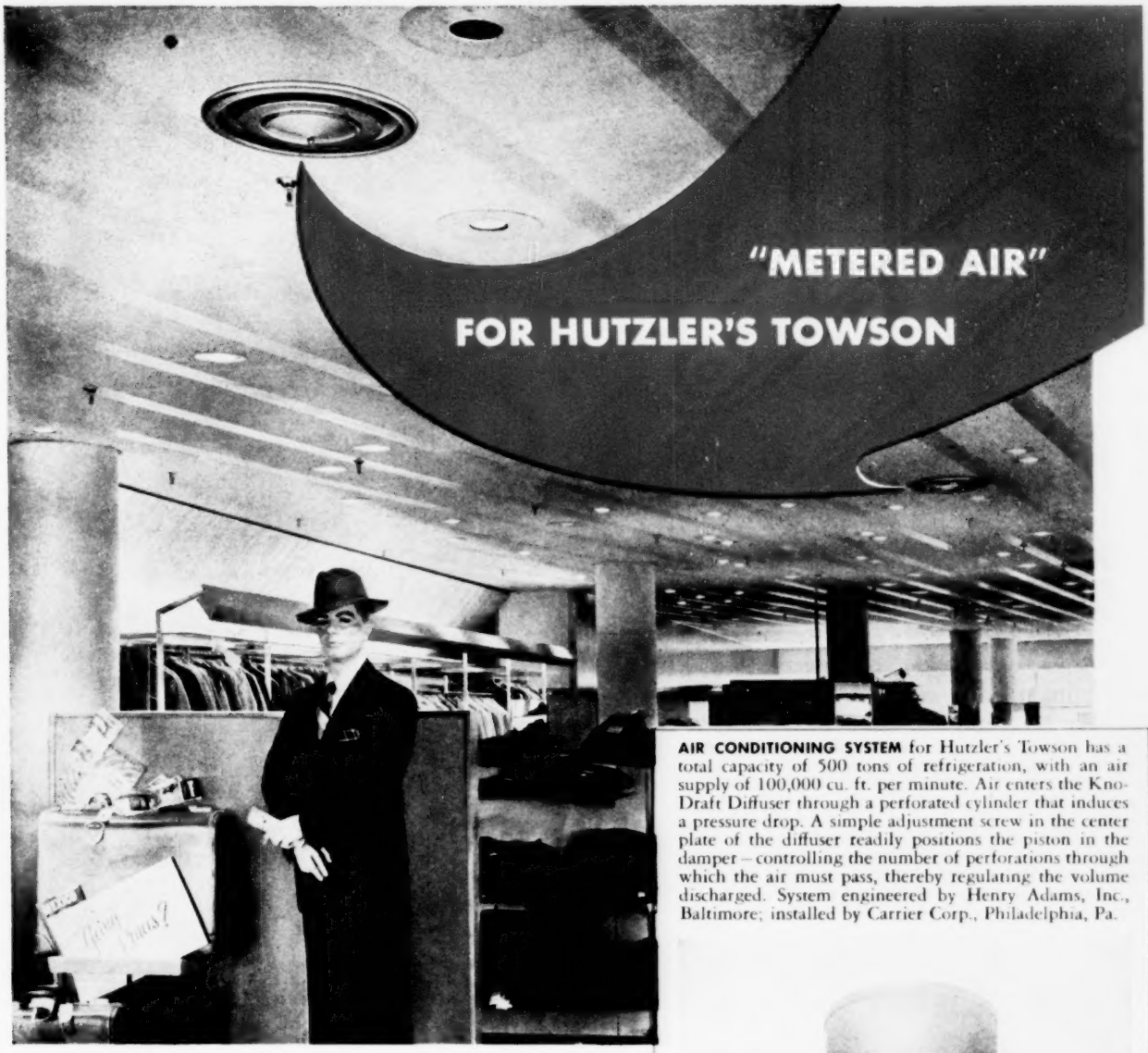
**COAL** is the safest fuel to store and use.

**COAL** is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

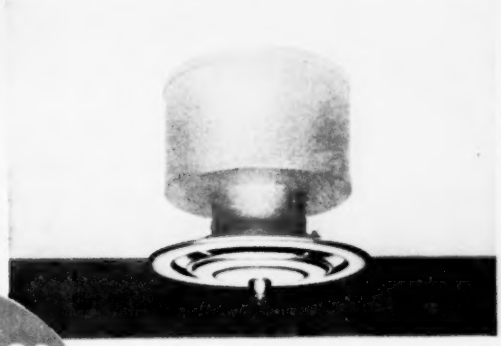
**BITUMINOUS COAL INSTITUTE**
A DEPARTMENT OF NATIONAL COAL ASSOCIATION
**WASHINGTON, D. C.**

*FOR HIGH EFFICIENCY FOR LOW COST*

# YOU CAN COUNT ON COAL!




**AIR CONDITIONING SYSTEM** for Hutzler's Towson has a total capacity of 500 tons of refrigeration, with an air supply of 100,000 cu. ft. per minute. Air enters the Kno-Draft Diffuser through a perforated cylinder that induces a pressure drop. A simple adjustment screw in the center plate of the diffuser readily positions the piston in the damper—controlling the number of perforations through which the air must pass, thereby regulating the volume discharged. System engineered by Henry Adams, Inc., Baltimore; installed by Carrier Corp., Philadelphia, Pa.



Department store air conditioning calls for extreme flexibility. Shifts in store layout are frequent and unpredictable, and the air diffusers, wherever located, must be readily adaptable to needed air changes. So—

For Hutzler's Towson, a branch store of Hutzler Brothers Co., Baltimore, a special Kno-Draft High Pressure Air Diffuser was developed. This permits the air to be distributed through small uniform-size pipelike ducts at high pressures and velocities, and diffused through conventional flush-mounted diffusers installed in a hung ceiling.

These special Kno-Draft High Pressure Air Diffusers permit air supply in any given area to be changed without unbalancing the air delivery of the other outlets. The air, in effect, is "metered." And this is done without creating any objectionable noise, and for a cost comparable to a conventional system of the same capacity.

For a more detailed description of this unique method of high pressure air distribution, simply mail us the coupon. Connor Engineering Corporation, Danbury, Connecticut.

CONNOR ENGINEERING CORPORATION

**kno·draft**®

adjustable air diffusers

see our catalog in ARCHITECTURAL FILE or write for copy

**CONNOR ENGINEERING CORPORATION**
**Dept. J-83, Danbury, Connecticut**

Please send, without obligation, your bulletin describing the NEW Kno-Draft Adjustable Air Diffuser for high pressure air distribution.

**Name** .....

**Position** .....

**Company** .....

**Address** .....

# CHASE® copper water tube *goes in for good!*

**See that shiny** Chase Copper Water Tube! Smart plumbers choose it every time. They know it's lightweight, easy to handle, and *it makes satisfied customers for years to come.*

Chase Copper Water Tube is corrosion-resistant . . . *won't clog with rust* and always gives a full flow of rust-free water.

Chase Copper Water Tube and Chase Solder-Joint Fittings are a combination that just can't be beat for hot and cold water lines, radiant panel heating and for drainage lines, too. Sold by Chase plumbing and heating wholesalers.

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

*The Nation's Headquarters for Brass & Copper*

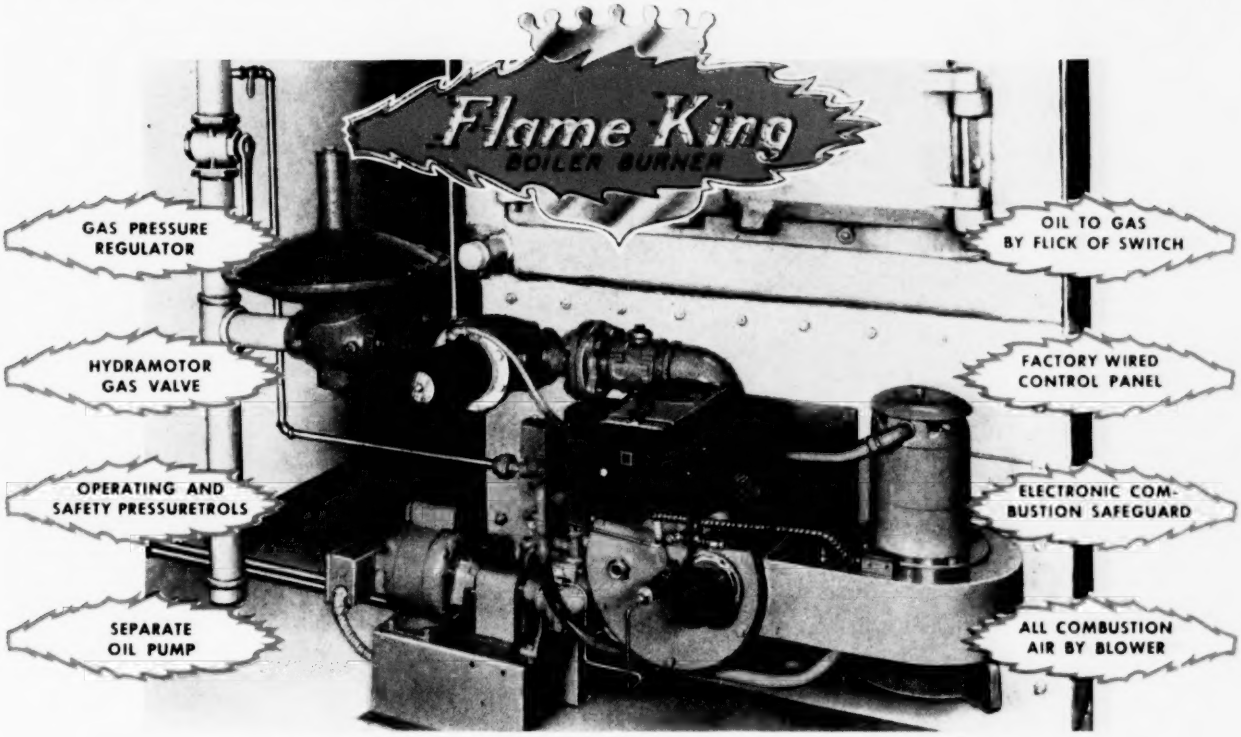
| | | | | |
|---|---|---|---|---|
| Albany† | Cleveland | Kansas City, Mo. | New York | San Francisco |
| Atlanta | Dallas | Los Angeles | Philadelphia | Seattle |
| Baltimore | Denver† | Milwaukee | Pittsburgh | Waterbury |
| Boston | Detroit | Minneapolis | Providence | |
| Chicago | Houston | Newark | Rochester† | (†sales |
| Cincinnati | Indianapolis | New Orleans | St. Louis | office only) |

# Ultimate Performance

**30 to 1000 horsepower**

# NORTH AMERICAN

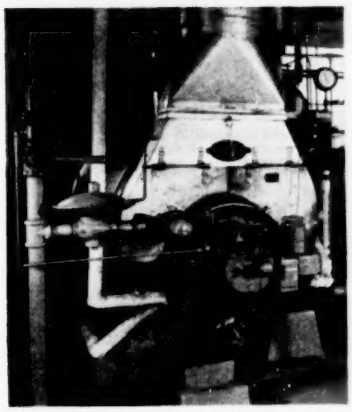
**GAS, OIL or DUAL-FUEL**




116 Dual-Fuel Burner illustrated available in models ranging from 30 to 83 HP

FLAME KINGS are available as gas or oil burners (that may be field converted to dual-fuel) or dual-fuel burners that will burn either fuel at the flip of a switch. Design, backed by 30 years of combustion experiences and proven by years of installations in all types of boilers, assures maximum efficiency on either fuel.

Factory packaging of FM approved electronic combustion safeguard systems provides for easy installations! Plug-in electrical components allow minimum maintenance! Burner efficiency is not dependent upon stack draft since a blower supplies 100% of the air for combustion! Blast-type gas pilot provides for positive and safe ignition!



FLAME KING on Scotch Marine Boiler

Natural gas (only 3" wc pressure necessary), mixed low pressure gases, or No. 1, 2, or 3 fuel oil burned at peak combustion efficiencies! Separate oil pump is operated only when burner is burning oil!

If you are interested in modern, efficient burners at reasonable prices, call your nearest FLAME KING distributor, or send in the coupon below.

• ● •

Some areas still available for distributing representatives.

CUT OUT AND PASTE ON YOUR LETTERHEAD

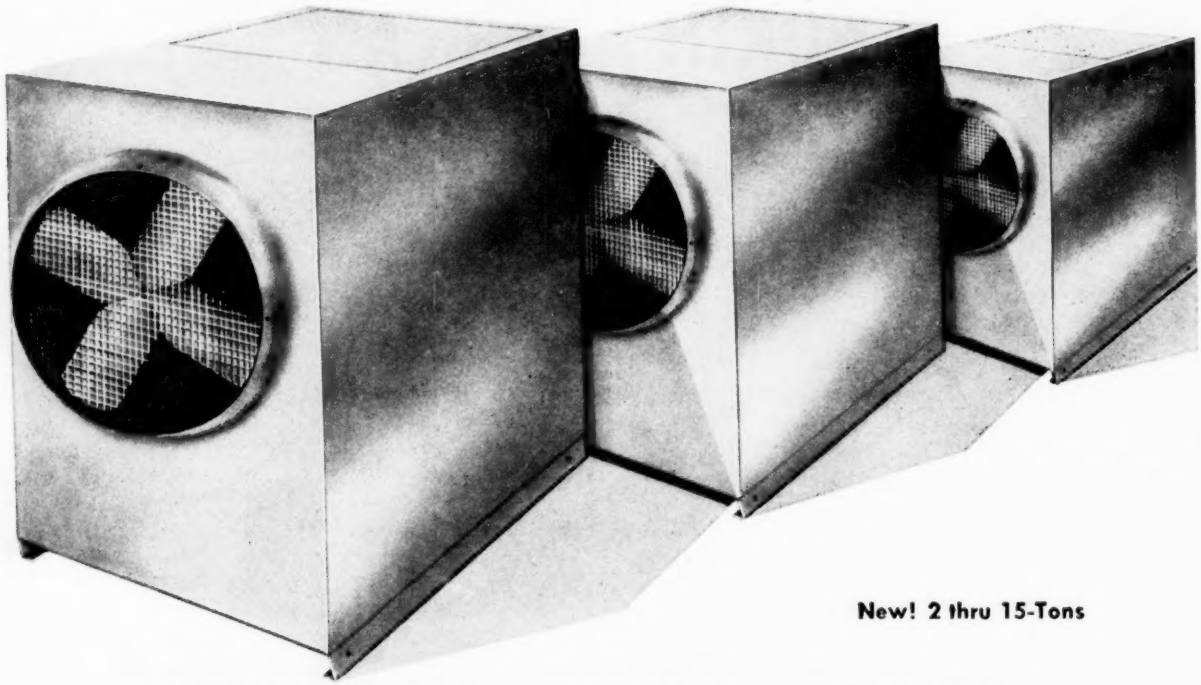
*We want more information*

NAME_____

TITLE_____

Mail today to
The NORTH AMERICAN Mfg. Co.
Cleveland 5, Ohio

# RESIDENTIAL COOLING TOWERS



New! 2 thru 15-Tons

## ONLY HALSTEAD & MITCHELL OFFERS THE

# 20-Year Guarantee!

## ON THE WETTED DECK SURFACE

### PRICED FOR THE HOME MARKET

Price-wise these Halstead & Mitchell Residential Cooling Towers throw open huge segments of the home and small building market to air-conditioning. Here is the development for which the industry has been waiting. Check prices today!

### NOW REQUIRED IN MANY AREAS

Residential Cooling Towers recirculate precious water . . . meet requirements of municipalities which prohibit wasting cooling water to sewers. And low cost H&M units take residential air conditioning to the suburbs and rural area . . . recirculate from a cistern if need be!

### MADE FOR REAL OPERATING ECONOMY

Economical, lastworthy . . . low operating cost matches low initial cost. Efficient gravity-type distributing pan eliminates windage loss since atomizing by spray nozzle is unnecessary. Low pump head pressure is another bonus of gravity distribution. And maintenance is a snap!

### FAMOUS HALSTEAD & MITCHELL QUALITY

Here's *all* the quality for which Halstead & Mitchell Cooling Towers are world famous — including the 20-year Guarantee on the wetted deck surface of pressure-treated creosoted wood, against attack by rotting or fungi growth. Stainless steel fans and shafts, plus individual cabinet coatings of Vinsynite, Vinyl Zinc and chlorinated rubber add important years of life. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service.

**AT LEADING WHOLESALERS EVERYWHERE**

**Write for descriptive bulletin from Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers, and Cooling Towers up through 100-tons.**

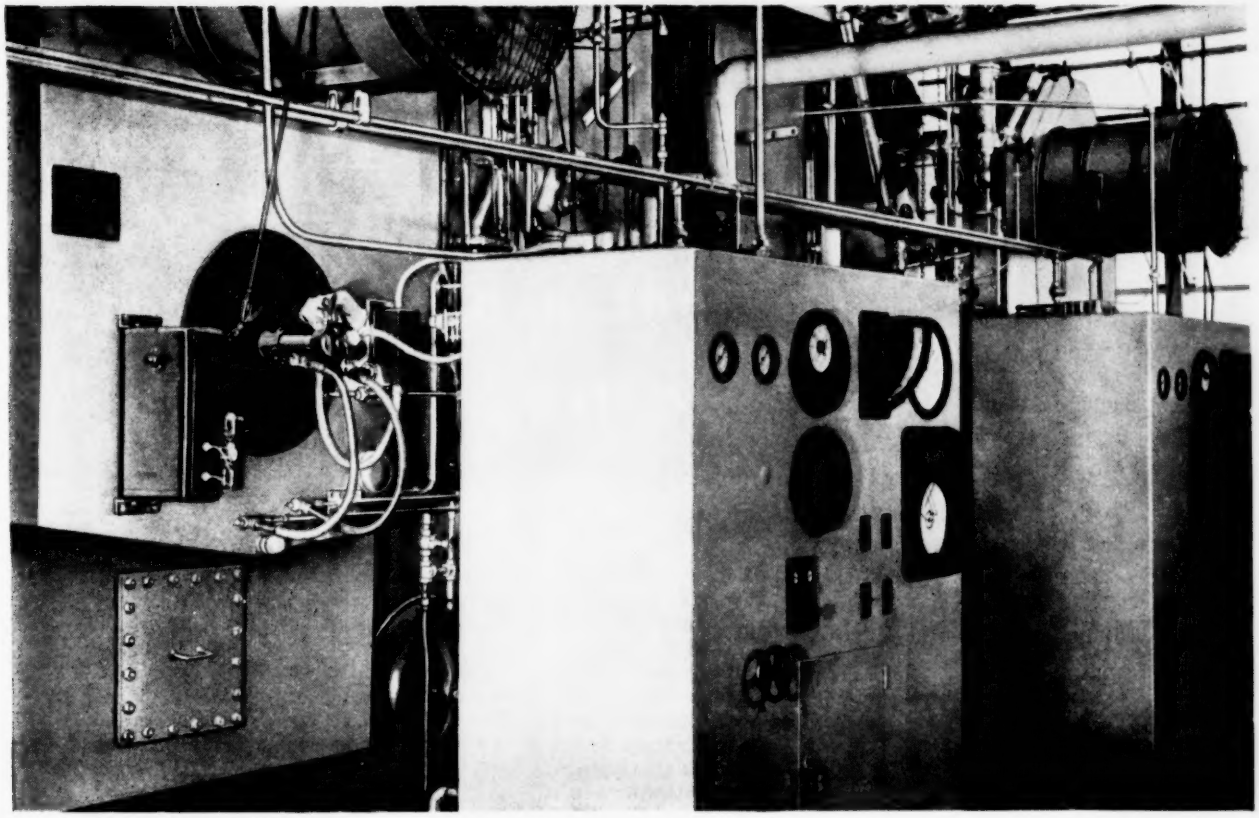
Halstead & Mitchell

**OFFICES: BESSEMER BUILDING • PITTSBURGH 22, PA.**

**keeping steam cheap . . .**

# Rx for HOSPITALS

## with the B&W Type FM Boiler



These two Type FM, B&W Integral-Furnace Boilers supply steam for all heating, cooking, and laundry requirements at a large midwestern hospital.

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Among the many enthusiastic users of the shop-assembled B&W Integral-Furnace Boiler, Type FM, hospitals have found it uniquely suitable to meet their varied steam requirements. Typical of the FM Boilers now serving hospitals in various parts of the country is this dual-unit installation, which is supplying low-cost steam for all heating, laundry, and cooking requirements at a midwestern institution.

Easy to install, this compact B&W steam generator is delivered complete with firing equipment and controls . . . is ready to skid or lift into position, hook-up, and place in operation. Push-button starting and stopping and automatic handling of load variations simplify operation . . . make the Type FM Boiler ideal for small to medium-sized installations where operators have additional duties. Even for some larger installations it has been found practical and more economical to have a multiple-unit, Type FM installation rather than one or more large boilers requiring complete field erection and close operating supervision.

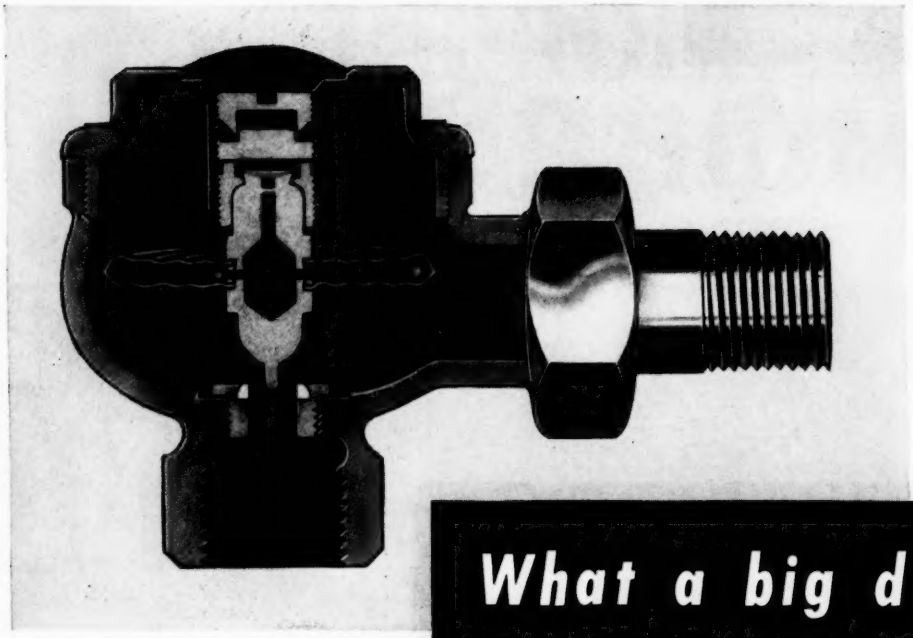
Available in standard sizes for loads ranging between 2900 and 28,000 lb of steam per hr at pressures to 235 psi, this efficient B&W unit is already enjoying wide popularity with users in a broad range of industrial, commercial, institutional, and other classifications . . . is in service or on order for a total steam capacity approaching 7,000,000 lb per hr.

*For a detailed illustrated description of how you can benefit from the cost-saving features of the B&W Type FM Boiler, write for Bulletin G-76A. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.*

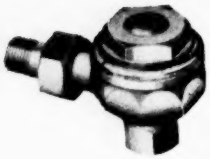
BABCOCK & WILCOX

BOILER DIVISION

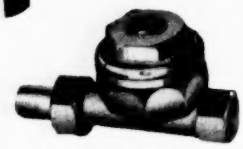
G-611



# What a big difference a trap can make!

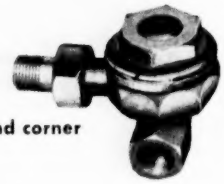


Angle



Straightway

Vertical



Left hand corner

Right hand corner

Marsh Packless Radiator Valves are perfect team mates for Marsh Radiator Traps. The metal-to-metal seal places them in a class all their own.

Yes, the success or failure of a steam distribution system can hinge on things as small as radiator traps. That's why it pays to use Marsh Radiator Traps—traps that are individually and permanently adjusted to close tight on steam, but open promptly and pass air or condensate at temperatures only a few degrees below closing temperature.

The part that provides positive operation in Marsh Radiator Traps is that rugged-but-sensitive thermostatic diaphragm. After this element has been assembled it is made completely seamless by a heavy overall deposit of copper. It is then filled with an accurately measured charge of volatile fluid; finally tested by expert operators to make sure that its expansion and contraction is exactly right to produce the utmost efficiency and economy.

Construction throughout is in keeping with the effective diaphragm. Bodies are of extra heavy cast brass suitable for pressures up to 125 lbs. steam. Bonnet assemblies of a given type and size are interchangeable. Trap seats are renewable. All components are made with a large safety factor beyond rated operating pressures.

Next time make it Marsh throughout and see the difference . . . Marsh traps, packless valves, bucket traps, venting valves. All are covered in the new fact-filled catalog.

**MARSH HEATING EQUIPMENT CO.**

*Sales affiliate of Jas. P. Marsh Corporation*

**Dept. U, Skokie, Illinois**

# MARSH

*Heating Specialties* **SINCE 1865**

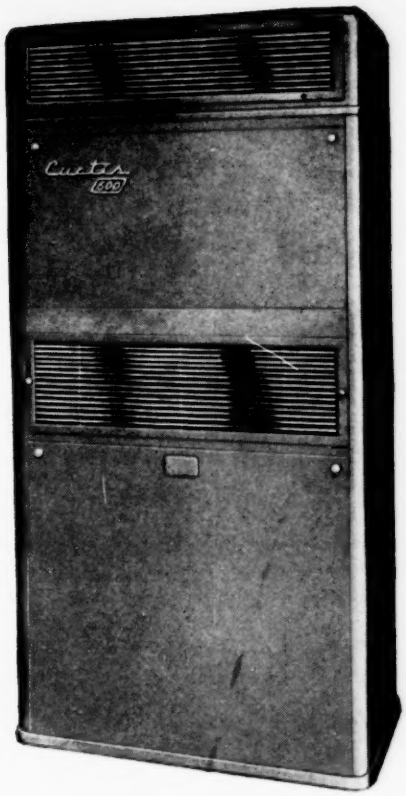
# YOU PROFIT BY

# Curtis EXPERIENCE

# in 15 years

# of Packaged Air Conditioning Pioneering

## *One of the First in the Industry*



Curtis units that were installed back in the days when packaged air conditioning was a novelty are still giving faultless service. Today's Curtis packaged units are better than ever . . . perfected by 15 years of experience.

**YOU'LL SELL** more packaged units when you sell these Curtis advantages:

- Long life, slow speed operation
- Quiet and dependable
- 5 year warranty
- Easy installation
- Attractive, modern appearance
- Complete range of sizes — 2, 3, 5, 7½, 10 and 15 tons

*Nationally Advertised in* THE SATURDAY EVENING POST, TIME and NEWSWEEK.

***For Full Information***
**MAIL THIS COUPON WITH YOUR LETTERHEAD**

**CURTIS REFRIGERATING MACHINE DIVISION**
*of Curtis Manufacturing Company (Since 1854)*
1999 Kienlen Avenue • St. Louis 20, Mo.

746

**CURTIS REFRIGERATING MACHINE DIVISION**
*of Curtis Manufacturing Company*
1999 Kienlen Avenue, St. Louis 20, Missouri

I am interested in direct factory franchise. Send complete details.

Company Name .....

Street .....

City ..... Zone ..... State .....

Signed .....

D.I.P.
FIRST IN THE FIELD OF PRE-SEALED INSULATED PIPING FOR STEAM HOT WATER REFRIGERANTS
Traffic has been running over this steam line for ten years without damaging the Durant Insulated Pipe.

# D.I.P. was installed here in less than 8 hours

For a New England railroad, over 120 feet of 6 inch steam line had to be run under eight tracks as quickly as possible—without delaying main line trains. A trench was opened under the tracks, limited in width by the distance between ties. The Durant pre-fabricated units were welded together, joints covered and sealed, and the elongated section was jacked through under the rails. Work was executed in less than eight hours. The only fill over the D. I. P. was the customary thickness of broken stone ballast. Traffic has been running over this steam line for more than ten years without damaging the D. I. P. units.

The cost of installing D. I. P. is extremely low because this conduit can be laid on the bottom of a graded open trench. No external casing-welding, no drains, tile, concrete tunnels, special tools or equipment are needed. Use of expansion loops, ells and tees eliminate manholes, expansion joints and other features requiring maintenance. For above-ground installation, any type of pipe support can be used.

D. I. P. is the *only* pre-sealed insulated conduit not dependent on a metal jacket for protection from moisture and corrosion. A 1" layer of asphalt is the waterproofing protection. Steam pressures up to 1000 psi.

**Write today for catalog 8-G, for engineering service, or a representative's call.**

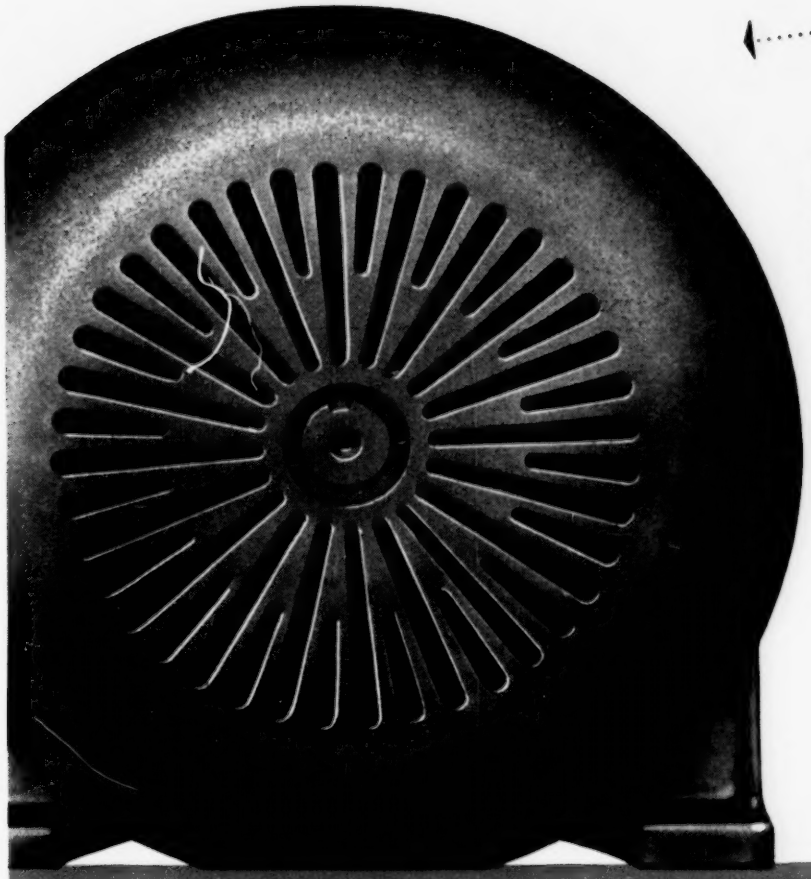
*Representatives in Principal Cities*

PRE SEALED ®

*Western Division:* **DURANT INSULATED PIPE COMPANY**
WARREN WAY AND BAY ROAD, PALO ALTO, CALIFORNIA

*Eastern Division:* **DURANT INTERNATIONAL CORPORATION**
WILLIAMSTOWN, NEW JERSEY

DEPENDABILITY . . .
that builds reputation
# Delco Motors



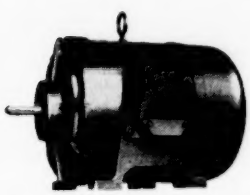
If your product needs a power source, look to Delco for the motor that will serve you best. Delco makes motors for most industrial applications . . . motors famous for dependability and long life under the toughest operating conditions.

So . . . check on Delco. You'll find a Delco motor that fits your needs. For complete details write to Delco Products, Dayton, Ohio, or to the nearest sales office listed below.

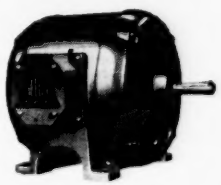
DELCO DAYTON OHIO

**DELCO PRODUCTS**

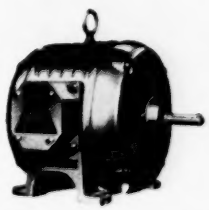
Division of General Motors Corporation
Dayton, Ohio



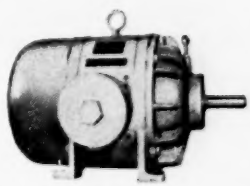
Totally Enclosed Fan-Cooled Motor



Open Ball-Bearing Motor



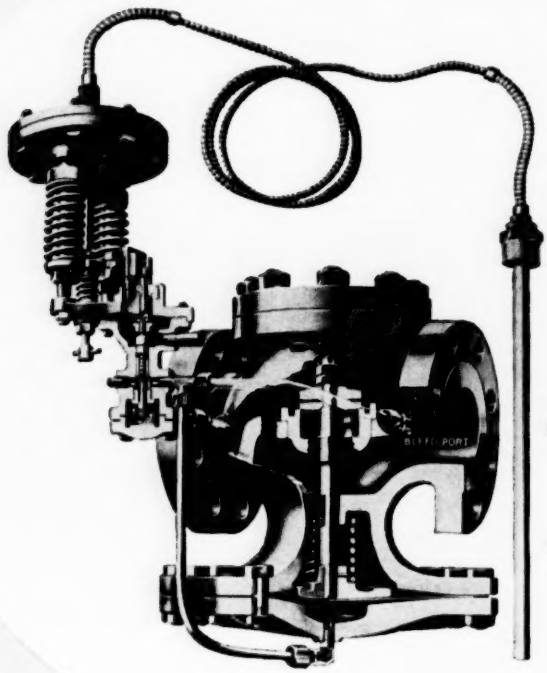
Totally Enclosed Motor



Explosion-Proof Motor

**SALES OFFICES:** Atlanta • Chicago • Cincinnati • Cleveland • Dallas • Detroit • Hartford • Philadelphia • St. Louis • San Francisco

# 3 Reasons for Accurate Regulation




PACKLESS CONSTRUCTION

LARGE BALANCED METAL DIAPHRAGM

SENSITIVE PILOT

Spence

Packless construction eliminates the need for closely fitted parts that may stick or bind due to dirt or uneven expansion of the parts.

In Spence Temperature Regulators, the Main Valve is actuated by a large balanced metal diaphragm which responds to the slightest changes in temperature.

Sensitive Pilots are designed to limit heater pressure to an adjustable maximum. As the temperature at the thermostat drops a few degrees there is a corresponding increase in steam pressure up to the limit for which the Pilot is set.

With regulators that respond only to temperature, an increase in load is accompanied by a momentary decrease in steam pressure caused by faster condensation in the heating element. There is a time lag until the thermostat senses the temperature drop and opens the valve wider. Spence Temperature Regulators act like pilot operated pressure regulators when this occurs. They respond instantly to maintain the steam pressure until the thermostat has a chance to further increase it as needed for the heavier load.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year, without requiring extensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.

SE128

**SPENCE ENGINEERING COMPANY, INC., Walden, New York**

# Engineered FOR ACCURATE FIT-UP

THIS TUBE-TURN Welding Return is engineered for shape, size and wall thickness to simplify piping installation. It is forged by the only process that produces a wall as uniform in thickness and true in circularity as the original seamless pipe. This assures accurate fit-up and perfect alignment . . . whether it is used as a full 180° return or cut to any odd angle.

When you specify TUBE-TURN Welding Fittings and Flanges, you are *sure* of getting the ultimate in piping simplicity, safety and permanently leakproof construction. Your nearby TUBE TURNS' Distributor is at your service!

*The Leading Manufacturer of Welding Fittings and Flanges*

## TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York · Philadelphia · Pittsburgh · Chicago · Houston · Tulsa · San Francisco · Los Angeles · Denver · Atlanta

Subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO • PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA.

HERE'S SERVICE

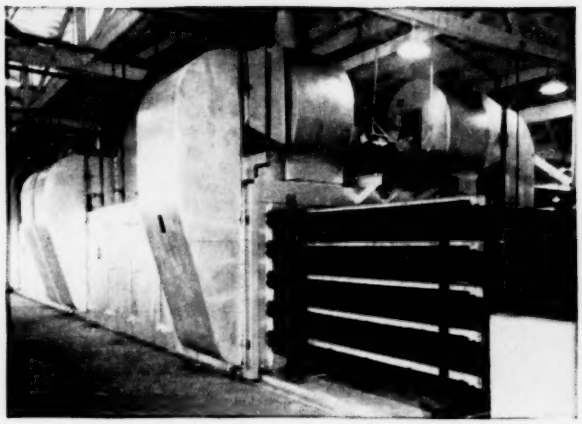
# TUBE TURNS' *Engineering Service*

## HELPS IMPROVE A DRYER DESIGN

C. B. McLaughlin, manager of TUBE TURNS' Engineering Service Division has been working with designers and piping men in the field for years. He and his men are at your service.

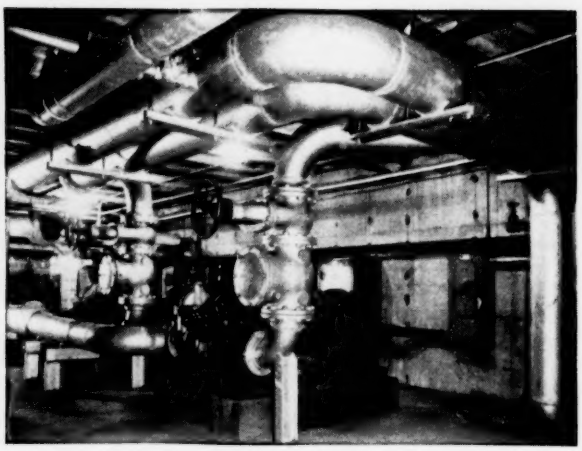
WHERE PIPING is a component of plant equipment, more and more designers are using TUBE-TURN Welding Fittings for directional changes. Results: greater design flexibility, reduced maintenance, less weight and space, improved operation. An example is the veneer dryer shown . . . a product of Coe Manufacturing Company, Painesville, Ohio. Progressive engineers of Coe, with the help of TUBE TURNS' Engineering Service Division, converted the heater from screwed connections to welded construction. Each of its banks of 1-inch pipes is joined by 180° TUBE-TURN Welding Returns. The coils carry steam at 200 psi pressure and 388°F. Joints are now permanently leakproof.

TUBE TURNS' Engineering Service is available to help in *your* piping problems.



Coe Veneer Dryer. Welded coils with TUBE-TURN Welding Returns are compact and permanently tight.

**YOUR DISTRIBUTOR** of TUBE-TURN Welding Fittings and Flanges can serve you promptly. He is backed up by the entire TUBE TURNS' organization.



**COMPACT.** Welded piping nests together . . . saves space. These condenser lines are for air conditioning system at Lazarus Department Store, Columbus, Ohio.

**Want Materials Data?**

**TUBE TURNS, INC., Dept. B-7**
224 East Broadway • Louisville 1, Kentucky

*Your name* .....

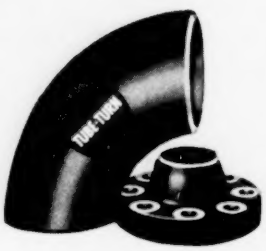
*Position* .....

*Company* .....

*Nature of business* .....

*Address* .....

*City* ..... *State* .....

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| | |
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| New York | Tulsa |
| Philadelphia | San Francisco |
| Pittsburgh | Los Angeles |
| Chicago | Atlanta |
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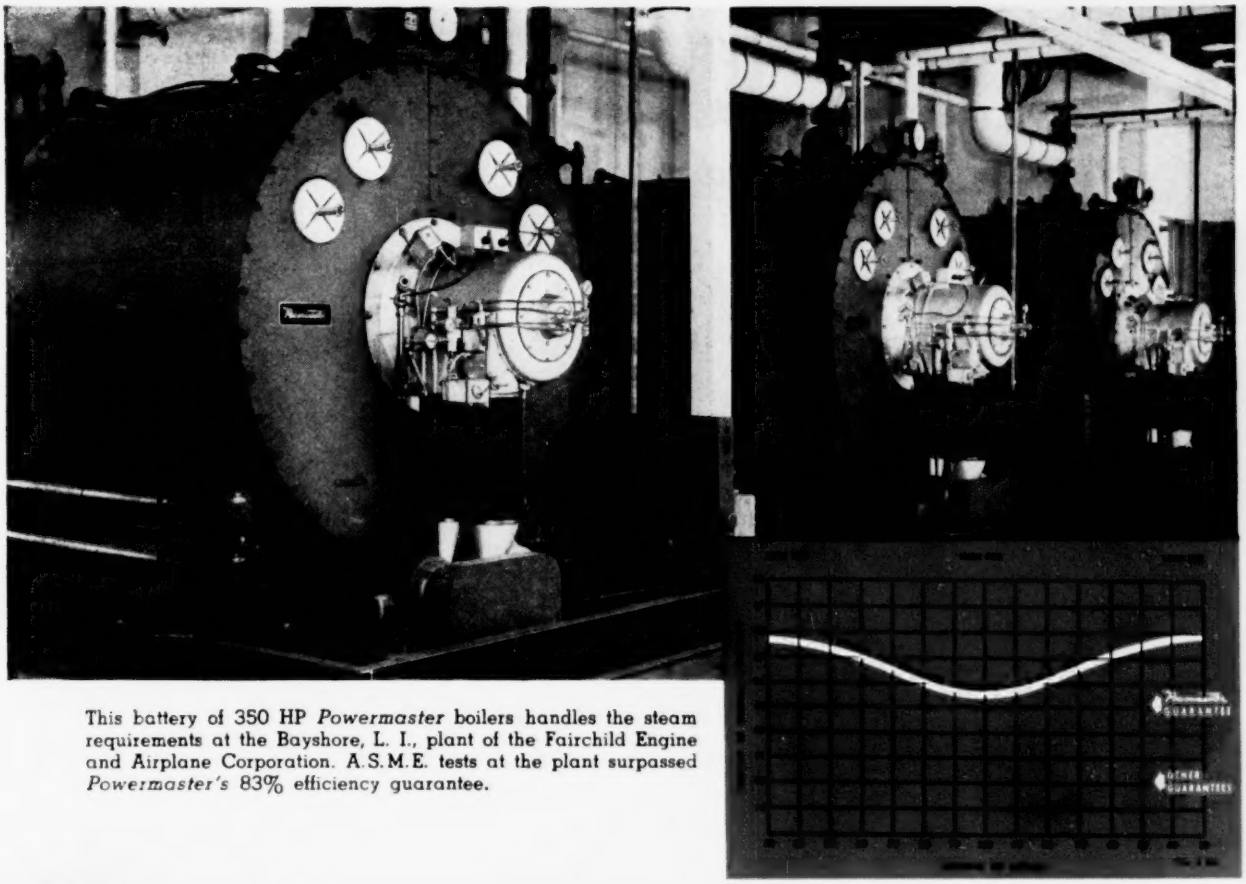
"tt" and "TUBE-TURN" Reg. U. S. Pat. Off.

# TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY



This battery of 350 HP *Powermaster* boilers handles the steam requirements at the Bayshore, L. I., plant of the Fairchild Engine and Airplane Corporation. A.S.M.E. tests at the plant surpassed *Powermaster's* 83% efficiency guarantee.

# 83% minimum efficiency with No. 6 Oil guaranteed only by Powermaster®

The "pay-off" on a boiler is its operating efficiency

Take a look at this typical efficiency curve of **Powermaster** . . . then compare A.S.M.E. tests with those of any other boiler! At less than full load (which is normal in field operation) notice that **Powermaster** efficiency actually **increases.**

There's a reason for such efficiency. The **Powermaster** is the development of 68 years' experience in boiler manufacture.

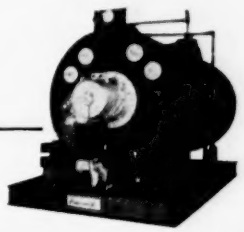
Continuing research and progressive engineering have consistently been reflected in **Powermaster** design.

Point-by-point, **Powermaster** welcomes comparison. Before deciding on a new boiler for your plant, be sure to get the facts on the new **Powermaster** with **Voriflow** combustion. Just drop us a line and we'll be glad to send you complete information.

Powermaster®

**PACKAGED AUTOMATIC BOILERS**

**In sizes to 500 HP; pressures to 250 psi.**



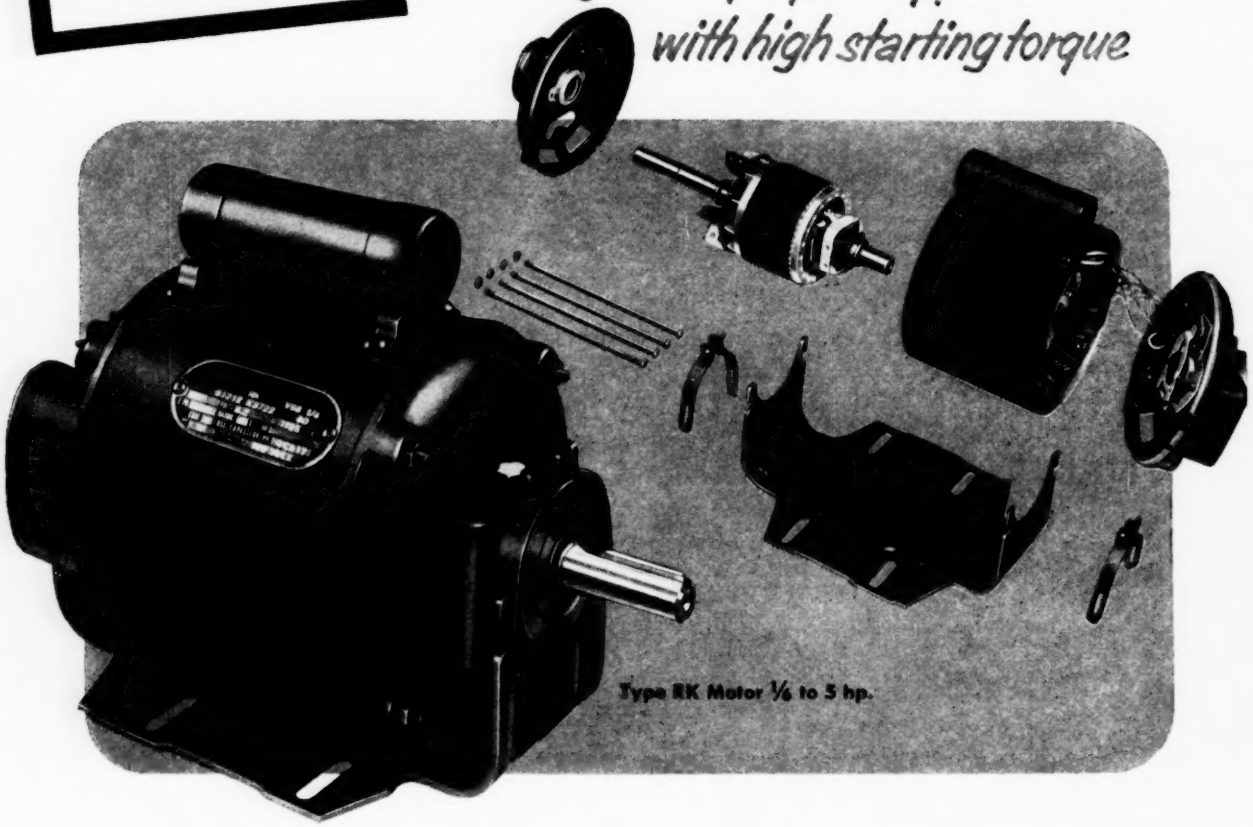
**ORR & SEMBOWER, INC. • *Established 1885* • 980 MORGANTOWN ROAD, READING, PENNA.**

**Wagner**
**ELECTRIC MOTORS**
**...the choice of leaders in industry**

# Wagner

## CAPACITOR-START MOTORS

*for general purpose applications with high starting torque*



Type RK Motor ⅙ to 5 hp.

Wagner capacitor-start induction motors are a sound choice for applications where starting loads are fairly heavy, but which can be brought up to operating speed quickly. They have become increasingly popular for installation on equipment such as air conditioners, refrigerators, freezers, water pumps, motor-driven tools, and on similar fractional or integral horsepower applications.

These motors offer low maintenance cost—only a minimum of servicing is required—and they give many years of reliable service with unusual freedom from vibration and noise.

* * *

When you standardize on Wagner Motors—you get the advantages of a liberal warranty . . . of nation-wide service facilities, with on-the-spot service, replacement motors and parts available from 25 Wagner-owned Service Branches and more than 750 Authorized Service Stations. You can choose from a wide variety of types and sizes—single-phase or polyphase—(from 1/125 to 400 hp). Bulletin MU-185 gives complete information—write for your copy.

®Wagner Electric Corporation EST. 1891

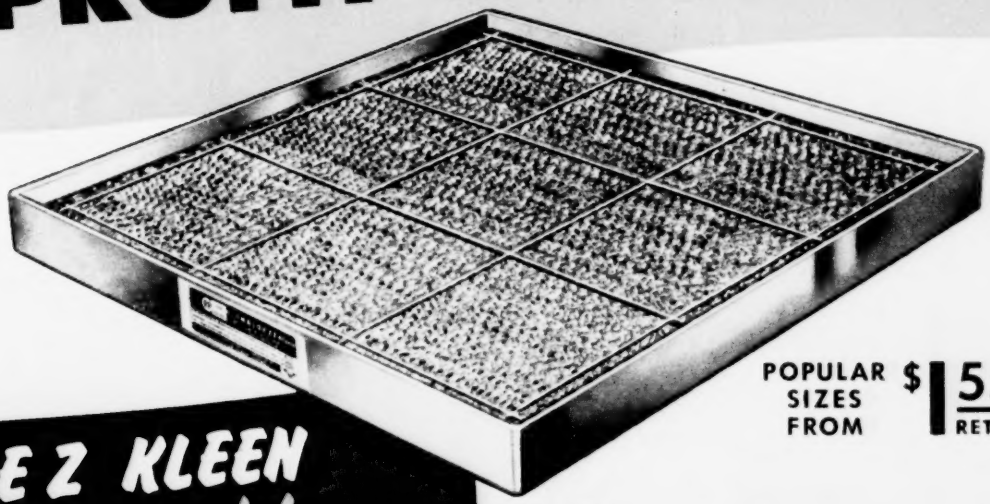
**WAGNER ELECTRIC CORPORATION**
**6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.**

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

**BRANCHES IN 32 PRINCIPAL CITIES**

M53-15

# Get this Fast Selling PROFIT BUILDER



POPULAR SIZES FROM $1.55 RETAIL

## E Z KLEEN Washable AIR FILTER

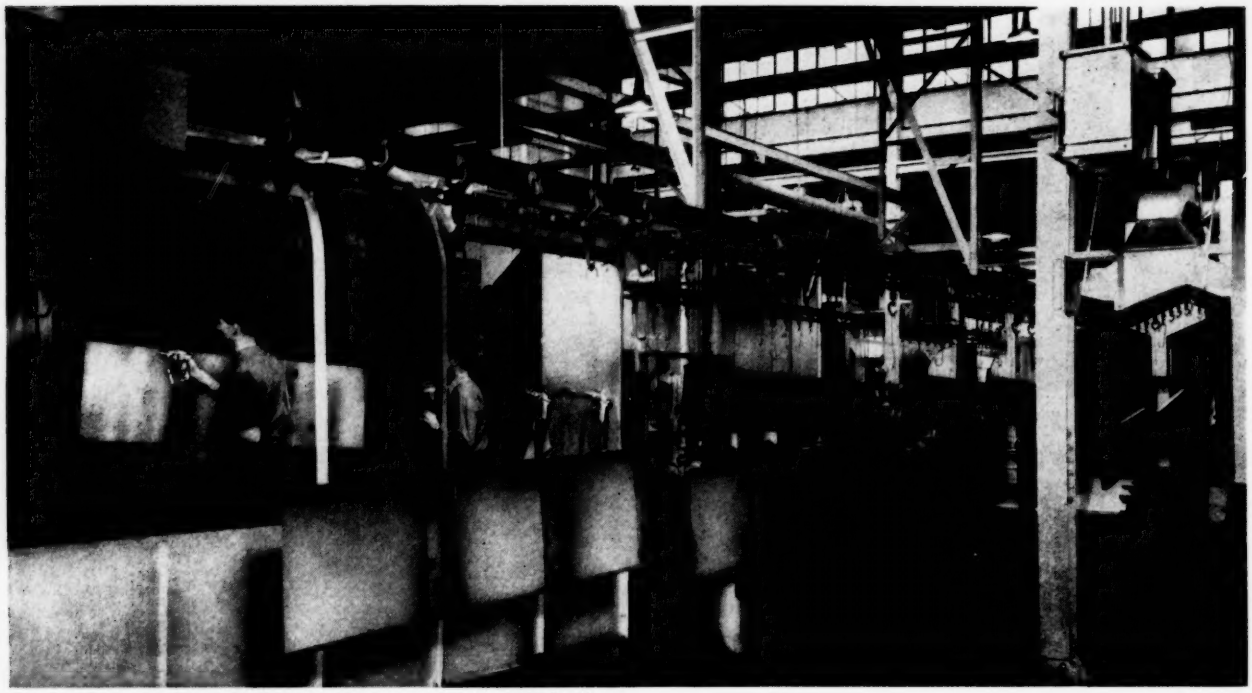
...for all forced air furnaces and air conditioners

## Now Pre-sold by National Consumer Advertising

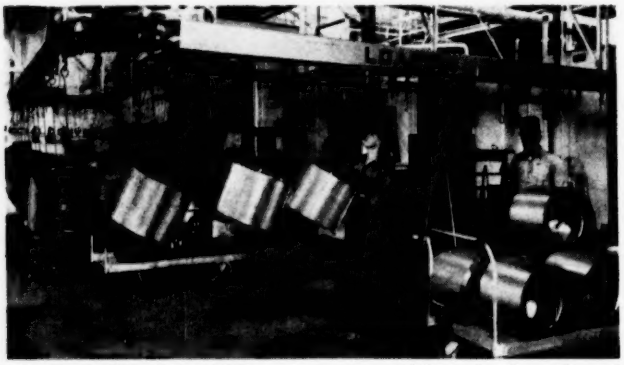
Here's an item that fits into every dealer's picture . . . a washable air filter for forced air furnaces and air conditioners! You get extra profits by selling them to homemakers who wish to service their own filters . . . or if you prefer, you can establish a high-profit filter service business. Order now from your jobber. Displays, window streamers, ad mats, stuffers and other sales helps are available.

RP . . . PRODUCTS OF RESEARCH

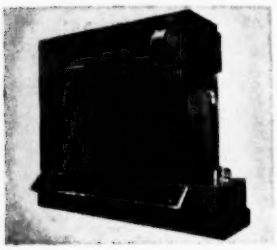
**RESEARCH PRODUCTS CORPORATION**
**Dept. 28, Madison 10, Wisconsin**



**SPRAYING CORROSION-RESISTANT ENAMEL** on metal panels for Worthington evaporative condensers and air conditioners. This chlorinated rubber base enamel, selected by Worthington after rigorous tests, resists chipping and long exposure to salt fog, acids, alkalis, ultra-violet light, and high and low temperatures.



**FAN HOUSINGS ARE LOADED** on conveyor which carries them through Worthington special 5-stage washing process. This washing, which includes sprays of Bonderite and mild chromic acid solution, prepares the equipment for the corrosion-resistant enamel.



**YEARS OF TROUBLE-FREE SERVICE** are assured with this Worthington evaporative condenser. The corrosion-resistant finish, rugged construction, large diameter hollow fan shaft and self-aligning ball bearings are some of the features that make this unit the finest available. You can get a Worthington evaporative condenser in any one of 18 sizes, in capacities of 10 to 150 tons.

# Rustproof finish adds years to life of air conditioning equipment

For years, corrosion has presented a real problem in air conditioning and refrigeration equipment. Brine spray, water, fumes—all caused metal equipment to corrode. To combat this, Worthington engineers developed the bonderized two-coat baked chlorinated rubber enamel finish now used on all Worthington air conditioning and refrigeration units.

This finish, the result of years of testing and research, completely protects the metal against corrosion and preserves the original appearance of the equipment. Rigorous tests have shown that this finish will last at least three to four times longer than the best hot-dipped galvanizing coating.

Advances in construction and design like this are standard practice with Worthington, a leader in air conditioning and refrigeration for over half a century. From giant industrial refrigeration systems down to the air-conditioner for a baby's nursery, Worthington can handle any job, and provide exactly the right equipment. So when you think of air conditioning or refrigeration—think of Worthington.

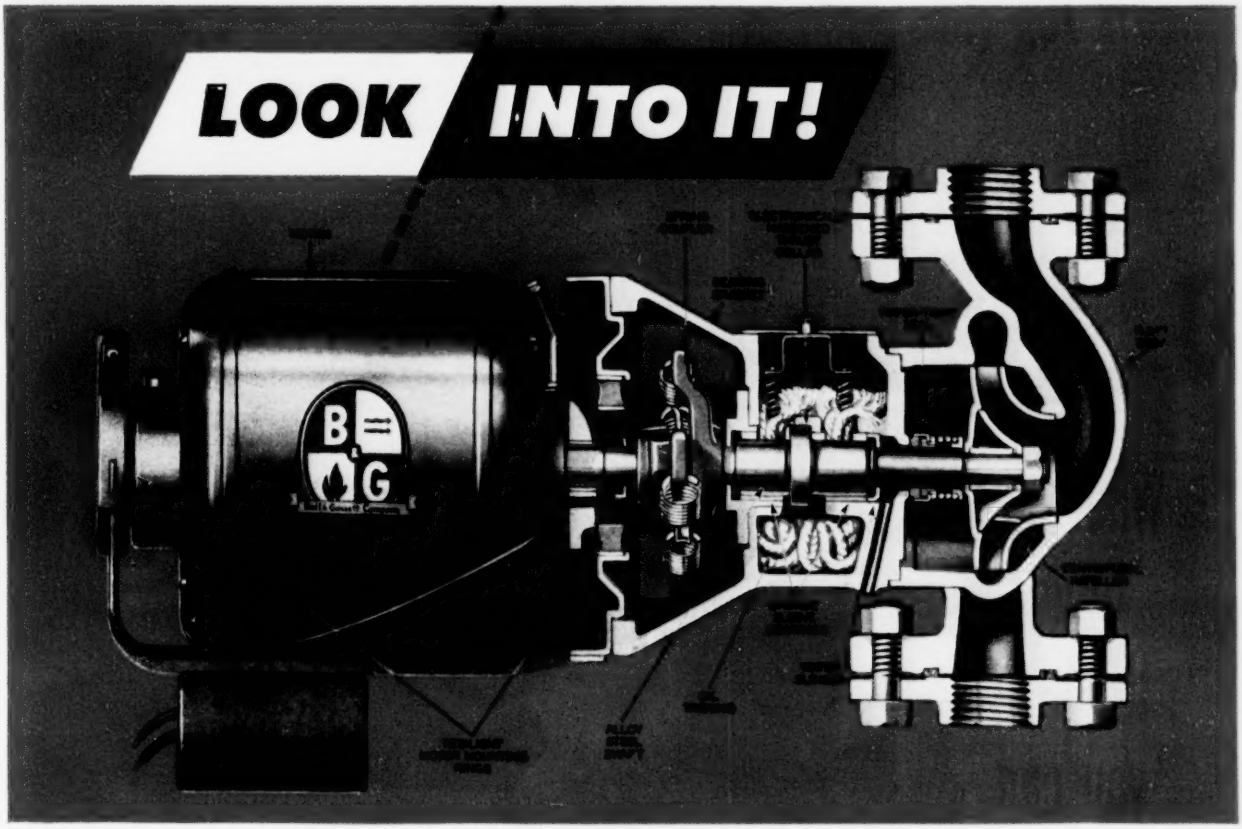
For more information, get in touch with your nearest Worthington distributor. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.40, Holyoke, Mass.

A.3.40

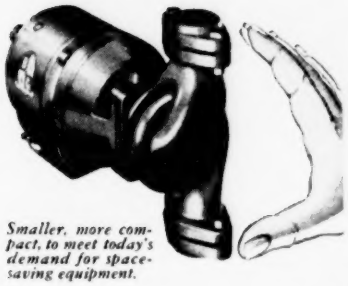
**WORTHINGTON**

***CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME***

# LOOK INTO IT!



## COMPARE THE B&G BOOSTER POINT BY POINT



*Smaller, more compact, to meet today's demand for space-saving equipment.*

One look is enough to show you why more B & G Boosters are sold than any other pump made for the same purpose. In every detail the Booster is precision-built... for failure-proof performance... long life.

**Leak-proof seal.** Precision-ground ...positively prevents water leakage into bearings.

**Shaft and bearings.** Shaft is hardened, polished steel. Bronze bearings are diamond bored... *extra long* for quiet, long-lived operation.

**Lubrication system.** Genuine oil circulating system positively protects the bearings.

**Thrust collar.** Specially hardened against wear... prevents noisy end-play.

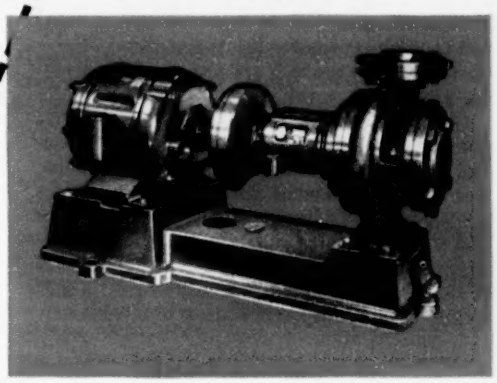
**Spring-type Coupler.** Simple, dependable... contributes to quiet operation. Shielded for safety.

**Impeller.** A true centrifugal design... balanced for smooth operation.

**Motor.** Specially designed and built to operate quietly. ¾", 1" and 1¼" Boosters have 1/12 H.P. motors but have exactly the same pumping capacity as previous models with larger motors.

**COMPARE THE B & G UNIVERSAL PUMP**

Not an ordinary centrifugal pump, but designed specifically to provide the quiet operation essential to forced hot water heating system operation. Has all the basic features of the B & G Booster.



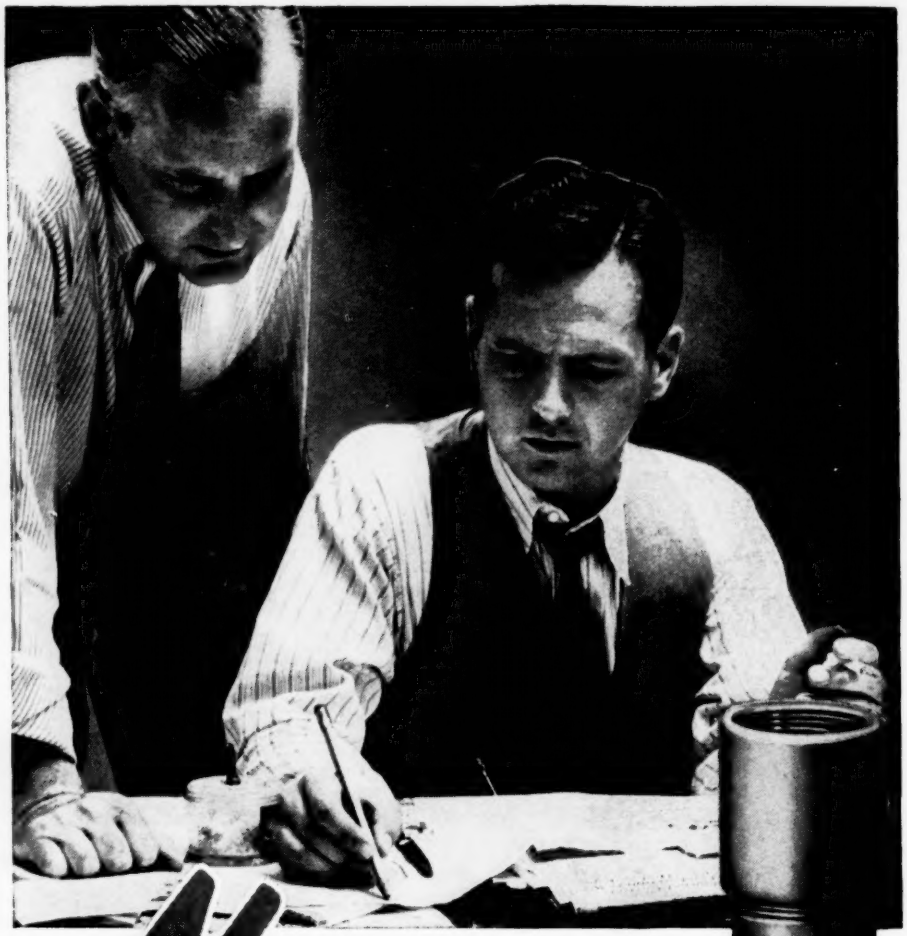
**For complete information send for B & G Catalog**

**BELL & GOSSETT**

**COMPANY**

**Dept. 7B-8 Morton Grove, Illinois**

*Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto*



# When you figure the pipe you can be sure—

## *if it's National*

● A lot of people have faced a lot of piping problems over the last 60 years. During that time, so many of them have solved their requirements with one pipe—NATIONAL Steel Pipe—that they have made NATIONAL the largest selling pipe in the world.

Other things have helped too . . . the fact that one integrated organization has complete control of U·S·S NATIONAL Steel Pipe production, from the raw material to the finished product . . . the fact that advanced steel-making facilities and special pipe manufacturing processes are here combined with the experience of thousands of skilled craftsmen to produce steel pipe of uniformly high quality and utmost dependability.

As a result, when you decide on NATIONAL Steel Pipe you can be sure you'll always get pipe whose metallic structure, strength, sound joints, superior cutting, bending and threading properties assure easy installation and long, trouble-free performance.

These are the reasons why "old timers" swear by NATIONAL Steel Pipe and why NATIONAL is being consistently specified by the new generation of architects, engineers and contractors. In turn they have found that for low cost, easy installation and *proved* reliability in service, no other pipe quite fills the bill like NATIONAL.

So when you need an all-purpose steel pipe . . . make it NATIONAL.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

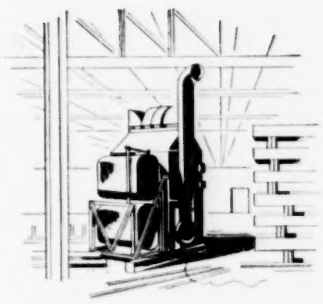
**U·S·S NATIONAL Steel PIPE**

UNITED STATES STEEL

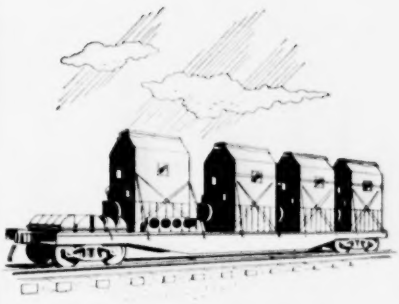
# These 12 DRAVO *Counterflo* SPACE HEATERS really got around!

Here's where the Dravo Heater's rugged construction and durability paid off for Ford Motor Company.

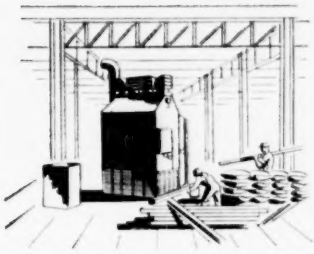
Back in the fall of 1950, Ford purchased 12 Dravo Heaters for temporary heating at Cleveland, Ohio, while Ford's new engine plant was under construction during the winter of 1950-1951.



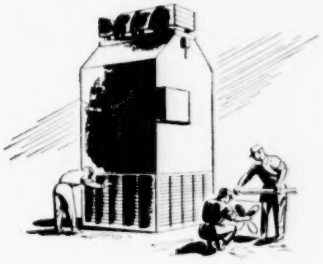
**1** The heaters maintained comfortable working conditions and kept the ground from freezing during zero weather so that concrete could be poured.



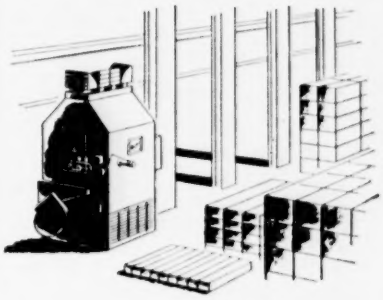
**2** After this new plant was completed, four heaters were shipped to Canada and were permanently installed in Ford's warehouse at Winnipeg.



**3** The other eight heaters were shipped to Kansas City, Mo., for use as temporary heaters during the construction of facilities similar to those in Cleveland.



**4** When that job was finished, the eight heaters were returned to Dravo at Neville Island, Pittsburgh, for overhauling and reconditioning by highly-skilled Dravo personnel.



**5** Now these eight Dravo *Counterflo* Heaters have been permanently installed for comfort heating at Ford's assembly plant at Buffalo, New York.

Only Dravo *Counterflo* Space Heaters could stand up under such extraordinary treatment and frequent moving. Dravo Heaters are a product of top-flight engineering and planning; their mill-type, heavy construction means long life, low maintenance and years of satisfactory service.

Dravo Heaters, backed by over 60 years of engineering experience, are available now in a range of sizes from 400,000 to 2,000,000 Btu. Find out how these superior Dravo Heaters can benefit you. Write for more information. Use the coupon.

**DRAVO**
CORPORATION

**PITTSBURGH • ATLANTA • BOSTON • CHICAGO • CINCINNATI**
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Dravo Corporation, Heating Department
Dravo Building, Fifth and Liberty Avenues
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DRAVO

Send me information about heating for the subjects I've checked, and Dravo Heater Catalog PQ 52 -1324.

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- ☐ Process drying and heat curing.
- ☐ Tempering make-up air.
- ☐ Temporary heating.
- ☐ For use in conjunction with air conditioning.
- ☐ Please have a representative call at no obligation to me.

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Company _____ Address _____

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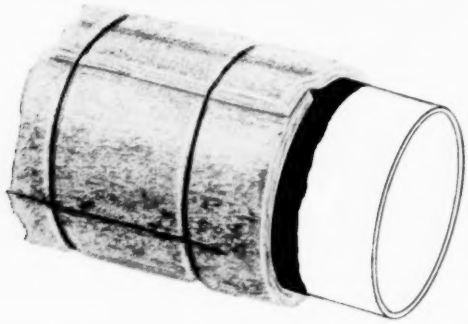
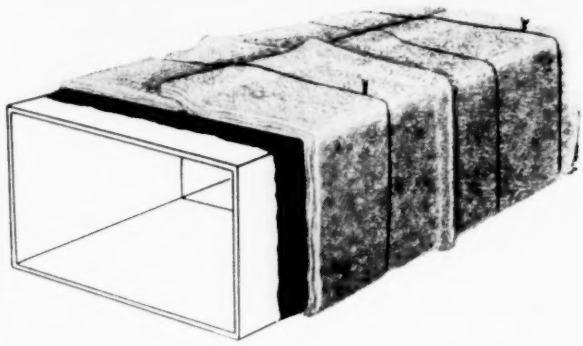
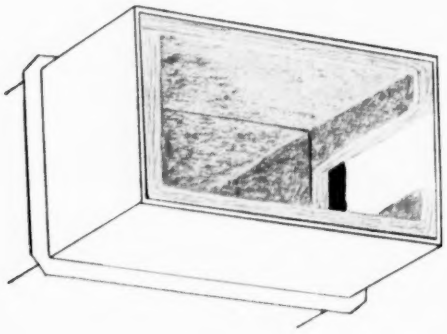






L·O·F Super·Fine Fiber·Glass is highly flexible, conforms to duct surface, around irregular contours or projections. Easy to handle, easy to cut, easy to apply.

# How to do a first-class insulating job on cooling and heating ducts

**FIRST,** use L·O·F Super·Fine Fiber·Glass. It's exceptionally efficient, needs little space. On heating ducts, it cuts heat loss sharply, saves fuel. On cooling ducts, it saves power, boosts over-all efficiency of system. As a duct liner, *faced* Super·Fine reduces sound of motors and blowers. And it lasts. Inorganic glass fibers won't burn, won't rot, won't absorb moisture. They're verminproof.

With L·O·F Super·Fine, you can give your customers first-class long-lived insulation jobs that back up your reputation for careful workmanship.

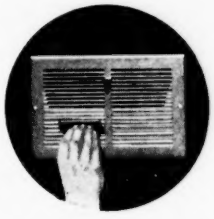
**SECOND,** send for free L·O·F folder on metal-air duct installations. In four meaty pages, it gives you helpful pointers about L·O·F Super·Fine's insulating and sound absorption properties, recommended installation steps, specifications, standard shipping sizes and other data.

**FREE!** Send for helpful installation folder. Libbey·Owens·Ford Glass Co., Fiber·Glass Division, 3183 Wayne Building, Toledo, Ohio.

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION

L O F GLASS PLASKON FIBER·GLASS

**FIBER·GLASS**



**efficiently designed for sidewall and baseboard installations**

The Standforated sidewall registers have horizontal bendable bars, set at time of fabrication for 30 degree downward deflection. Each bar can be easily readjusted with a tool to any angle for upward, downward or straight flow. **No. 41H SIDEWALL REGISTER** has a single damper and 3/16" turned down edge for flush sidewall installation. Sponge rubber gaskets are attached. **No. 43H BASEBOARD REGISTER** has a single damper and 7/8" projection top and two ends, for baseboard installation. Also available as: **No. 42H BASEBOARD INTAKE** and **NO. 40H SIDEWALL GRILLE**. Prime coat or metallic finish—standard screw holes. Over-all of face is listed duct dimension plus 1 3/8".

| DUCT SIZE |
|---|
| 8" x 4" |
| 8" x 5" |
| *8" x 6" |
| 10" x 4" |
| 10" x 5" |
| *10" x 6" |
| 10" x 8" |
| 12" x 4" |
| 12" x 5" |
| *12" x 6" |
| 12" x 8" |
| 14" x 4" |
| 14" x 5" |
| *14" x 6" |
| 14" x 8" |
| 24" x 4" |
| 24" x 5" |
| 24" x 6" |
| 24" x 8" |
| 30" x 4" |
| 30" x 5" |
| 30" x 6" |
| 30" x 8" |

*stock items

Registers are visible symbols of comfort. On your jobs, you want the best to show . . . so, to be *sure*, use Standard Stamping's Registers and Grilles. All Standard registers are engineered for accurate and easy operation. Illustrated above is model No. 41H Sidewall Register. The side view shows * one of the *two damper tension screws* that are adjustable to meet your operational requirements. The tension screws are set at the factory for positive operation. On the damper control lever is Standard's new **FRACTIONATOR VOLUME CONTROL.** This amazing new device allows you to set the damper for optimum volume in balancing your heating system, and maintain that balance permanently.

**MAIL COUPON NOW FOR MORE INFORMATION, FREE:**

**STANDARD STAMPING & PERFORATING CO.**
3129 West 49th Place, Chicago 32, Illinois

Gentlemen:
Please send me a copy of your new Pocket Catalog, at no obligation to me.

Name_____
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Address_____
City_____ Zone____ State_____

# Standard Stamping & Perforating Co.

3129 W. 49TH PLACE, CHICAGO 32, ILLINOIS

# NEW THRUSH TANKS

# *Reduce Draining Time*

## DRAIN COMPLETELY IN A FEW MINUTES

THE VACUUM BREAKER NOW IN ALL THRUSH PRESSURE TANKS

## *NO EXTRA COST*

***THE FIRST REAL IMPROVEMENT IN TANK DESIGN IN MANY YEARS! THRUSH ENGINEERING LEADS AGAIN!***

HERE'S AN ADDED convenience feature found only in Thrush Pressure Tanks! It saves your time! . . . saves labor! Reduces service bills! Pleases customers because you can get the system back in operation without delay. No need to drain the whole system. Just close the stop valve, open the drain and unscrew the Vacuum Breaker to allow air to enter the tank. A thirty gallon tank will drain in ten minutes. You get more for your money . . . build greater customer satisfaction, too . . . when you install genuine Thrush equipment. Ask your wholesaler about it or write Dept. D-8.

***TO BE SURE IT'S A GENUINE THRUSH PRESSURE TANK . . . LOOK FOR THE VACUUM BREAKER BEFORE YOU BUY!***

# H. A. THRUSH & COMPANY

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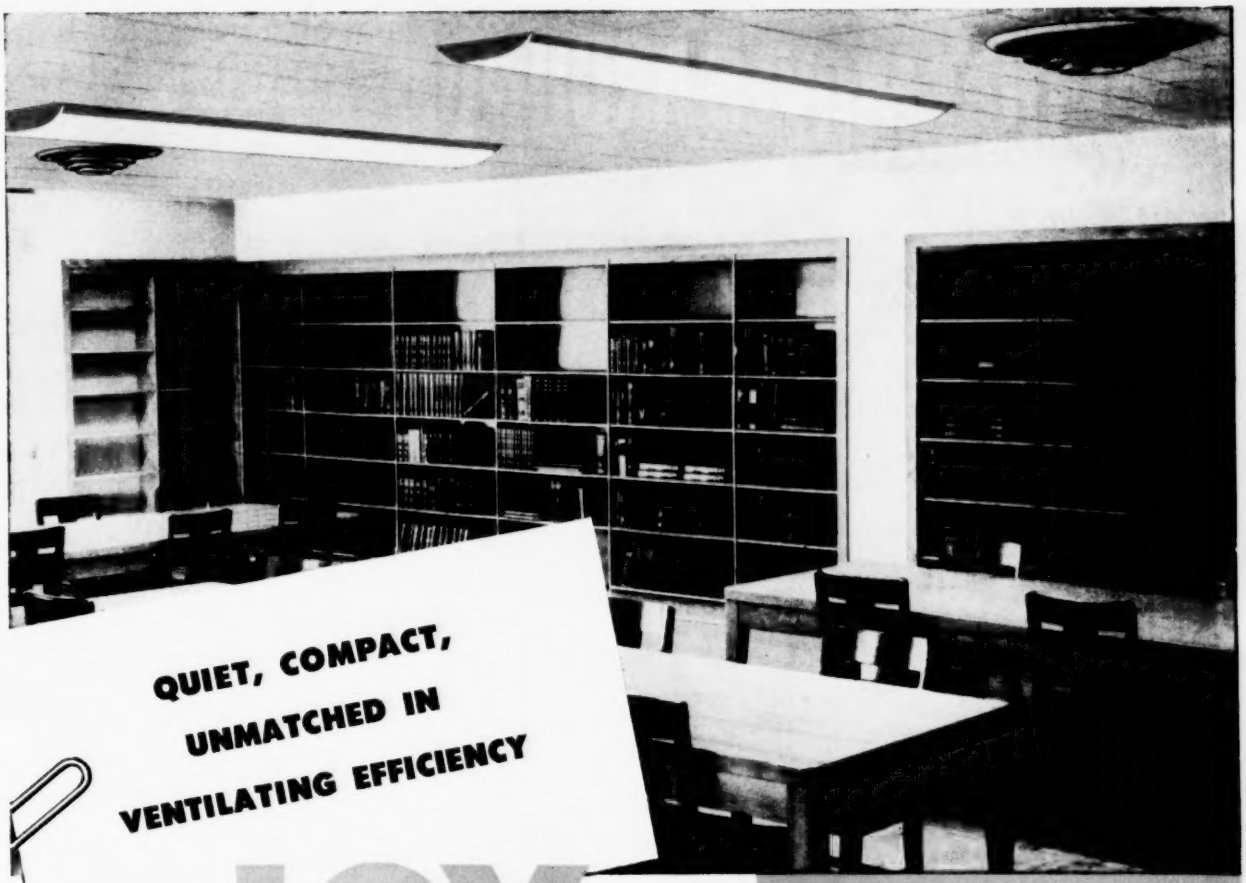


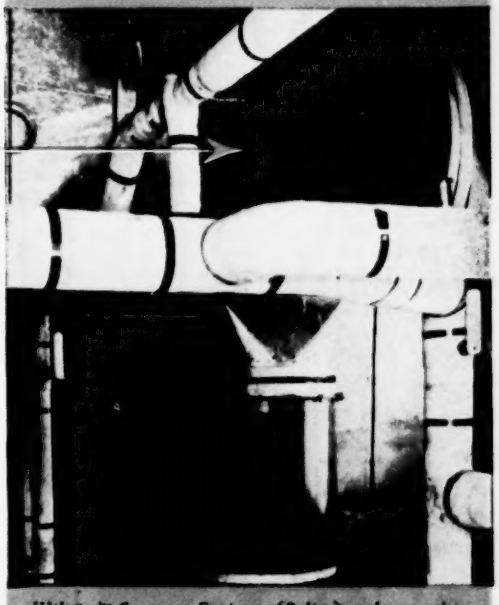
QUIET, COMPACT,
UNMATCHED IN
VENTILATING EFFICIENCY

# JOY
# AXIVANE® FANS

## ...BEST in Public Buildings

The compact, vaneaxial design of JOY AXIVANE Fans offers you important advantages of quiet, more efficient operation and savings on space requirements, installation costs, and power consumption. In addition, adjustable blades—a standard JOY feature—give you easy flexibility . . . you can make a simple on-the-job adjustment to meet new or changed conditions with greatest efficiency. ● For any ventilation job, check first with JOY—world's largest manufacturer of vaneaxial fans.

*View in the Kansas Wesleyan Memorial Library, Salina, Kansas, ventilated with JOY Fans. Note ceiling louvers.*



*Wilson & Company, Engineers (Salina)—the consulting engineers—selected JOY Fans for this job. They mount right in the air duct, saving space and installation cost.*

Write for Bulletin, or

*Consult a Joy Engineer*

W&D I 3520

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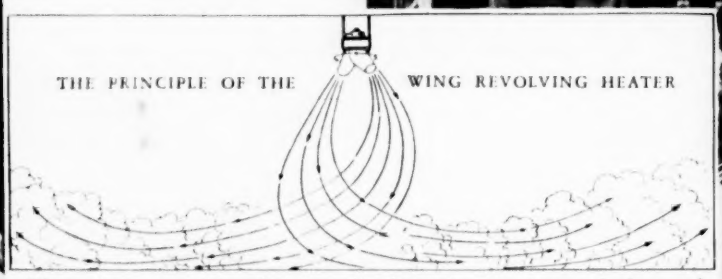
# HEAT THAT MOVES AROUND

THE fact that the discharge outlets of WING Revolving Unit Heaters keep the heated air in constant, gentle motion is one of the reasons why nationally known firms like the Budd Company have installed them in their plants, both at Philadelphia and in the one shown in this photograph, at Gary, Indiana. The big blanking and forming presses in this great plant present a natural barrier to ordinary fixed discharge heating systems, but not to the moving streams of heated air from the WING Revolving Heaters, even suspended, as they must be, far above the floor, to clear the cranes. That is equally true in the summer time when, with steam turned off, the cooling breezes from the revolving discharge outlets keep workers comfortable on the hottest days. Investigate. Write for Bulletin HR-6.




*The moving streams of heated air (or cooling breezes in summer) sweep slowly around through 360 degrees, covering successively every direction. The air velocity is sufficient to carry to walls, and remote corners and the constantly changing direction of flow causes the air to find its way around obstructions.*

**Wing**

**L. J. Wing Mfg. Co.**
158 Vreeland Mills Road
Linden, New Jersey
Factories: Linden, N.J. and Montreal, Can.
In Europe: Etab. WANSON, Brussels, Belgium

# MOTORIZED CHIMNEY DRAFT

## with the WING DRAFT INDUCER

No boiler can operate satisfactorily or efficiently over wide ranges of weather or load with variable natural draft. The fuel—whether oil, gas or coal—must have enough oxygen for complete combustion. There must be sufficient draft or furnace fires will be slow burning and lifeless, resulting in uneven, insufficient and irregular heat.

WING Draft Inducers insure positive, adequate, uniform draft regardless of variable weather conditions or inadequate chimney or breeching construction.

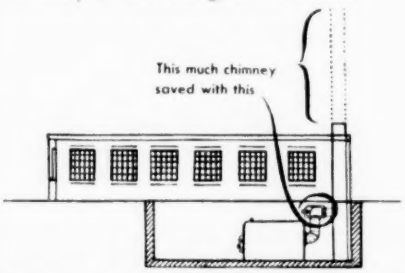
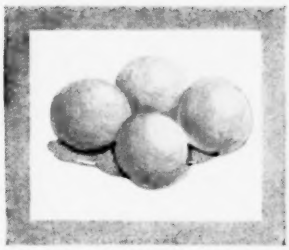



*Diagram above shows how much chimney is saved by installing Wing Draft Inducers.*

Wing Draft Inducers are suitable for use in connection with oil, gas, stoker-fired or hand-fired heating boilers, industrial furnaces or kilns, or high pressure steam boilers, either stationary or marine. Sizes are available for boilers as low as 1000 sq. ft. E. D. R. up to steam generators producing 100,000 pounds of steam/hr. Special, heavy duty designs available for these larger boilers.

Wing Draft Inducers are made in two types—for insertion in breeching or flue, or for installation on top of a chimney. Write for a copy of Bulletin I-52 to L. J. Wing Mfg. Co., 158 Vreeland Mills Road, Linden, New Jersey.

# Like  in a pod...

. . . all diffuser types in the new Aerofuse Type 'P' Series are identical in appearance with beautifully styled matching facial contours and the same number of rings. This outstanding feature insures uniformity when more than one type—or more than one size—is installed in a conditioned area.

Engineered to meet the most rigid specifications of efficient, satisfactory performance, each diffuser type in the new Aerofuse line is designed for a specific air delivery job. For an installation that is right, both in appearance and performance, specify Aerofuse at the vital point of air delivery.

**Type PA**
*Adjustable Pattern Diffuser*

**Type PS**
*Stepped-Down, Fixed Pattern Diffuser*

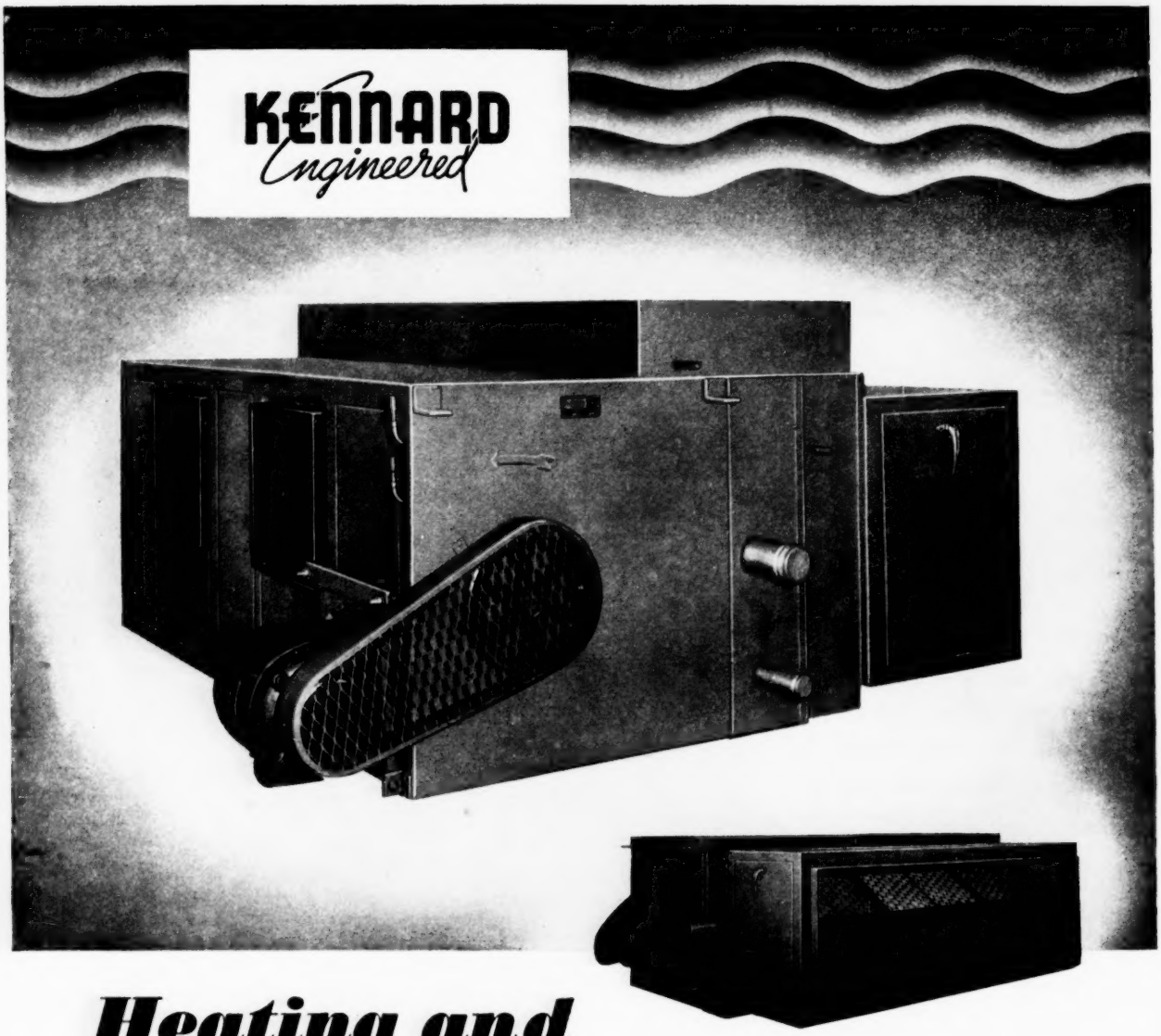
**Type PF**
*Flush, Fixed Pattern Diffuser*

**Type PR**
*Flush, Supply and Return Diffuser*

Write for copy of Catalog No. 105 . . . complete information, selection charts, engineering data.

TUTTLE & BAILEY inc
NEW BRITAIN, CONNECTICUT

KENNARD Engineered



# Heating and Ventilating Units

## Air Volumes from 400 to 21,000 CFM

Kennard Heating and Ventilating Units are the answer to requirements of heating and filtering recirculated air, fresh air, a mixture of both, or for ventilation only. These ruggedly constructed and easily installed units, conventionally used for heating large spaces or as a central station unit to heat many small rooms, can also be utilized for a variety of special and process applications.

Wall - Floor - Ceiling Mountings

Pre-heat and Re-heat Coils - 1.1 to 32.5 sq. ft. face.

Moderate tip speeds and outlet velocities

**Optional Equipment**

Mixing Box and Dampers • Face and By-pass Dampers • Throwaway, Cleanable or High Velocity Filters • Target, Grid or Pan Humidifiers.

***Representatives in Principal Cities***

*Write for name of nearest representative and complete information on Air Conditioning Blower Units—Finned Coils—Evaporative Condensers—Cooling Towers—Sprayed Coil Dehumidifiers—Multi-Zone Air Conditioning Blower Units.*

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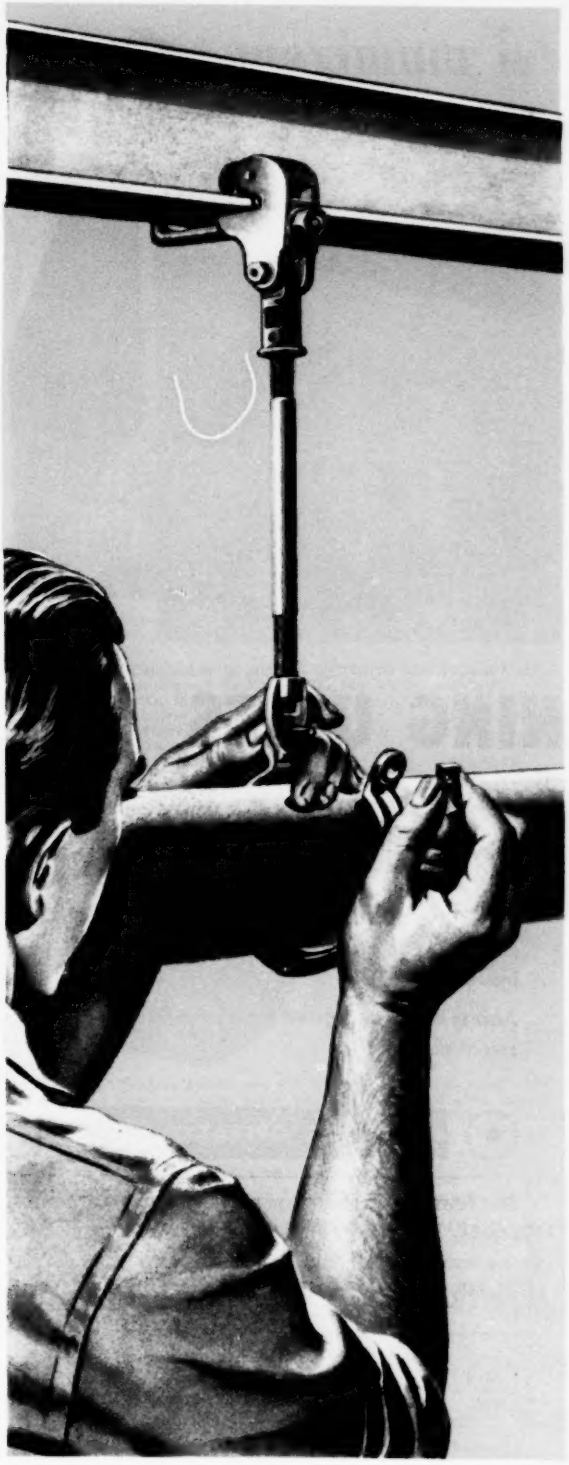


# Right for the job and priced right!

There's nothing sensationally "tricky" about this pipe hanger. It's just the most practical and inexpensive way of hanging pipe for a great many jobs. Complete assembly includes a split pipe ring and socket, rod, extension piece and universal I-beam clamp. Available for pipe from ½" to 8", for loads from 75 to 1510 lbs.

It is well worth remembering that a good piping job is too important to jeopardize with improvised or inadequate pipe hangers and supports. You can get from Grinnell just the right pipe hanger for any job within the shortest possible time at the lowest cost consistent with quality.

Grinnell has the most complete line of pipe hangers, extensive manufacturing facilities, warehouses across the country, and jobbers in almost every city and town.

**UNIVERSAL SIDE I-BEAM MALLEABLE IRON CLAMP (Fig. 225)** . . . Used on American Standard I-beams as well as wide flange beam sections. One of 14 different Grinnell beam clamps to meet varying specifications.

**MALLEABLE IRON EXTENSION PIECE (Fig. 157)** . . . Bolts into Universal Side I-beam Clamp (Fig. 225) and other malleable iron clamps to receive hanger rod. Provides for adjustment of rod.

**MALLEABLE IRON SPLIT PIPE RING AND SOCKET (Fig. 107R)** . . . Once hanger rod is turned to proper adjustment and the attached half of the ring is snugged against the pipe, the other half of the ring is swung up into position and bolted. For 13 pipe sizes, ½" to 8", for loads from 75 to 1510 lbs.

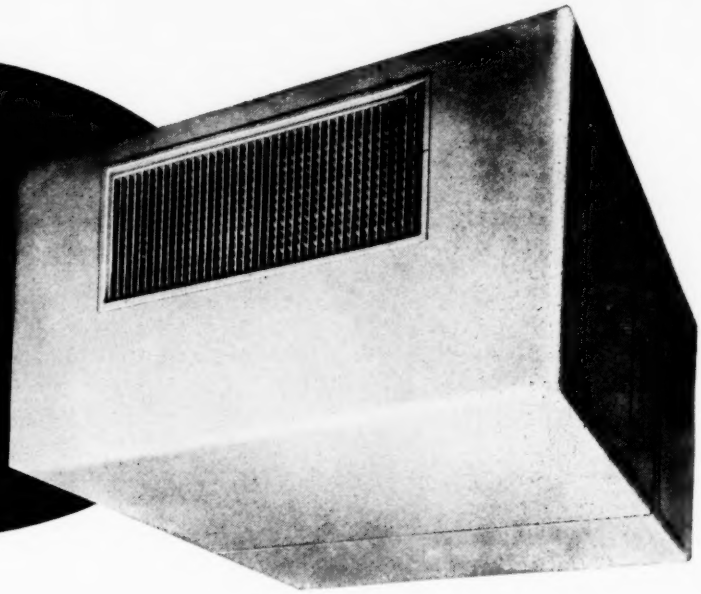
# GRINNELL

**WHENEVER PIPING IS INVOLVED**

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

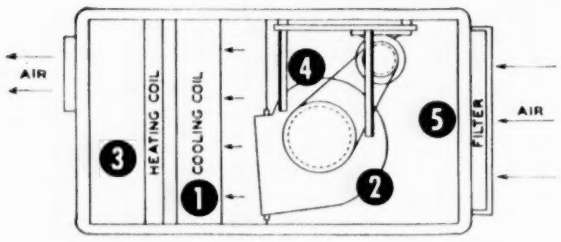
Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

# NEW FEATURES of PROVEN MERIT



KRAMER

# AIR CONDITIONING UNITS




### 1 MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

### 2 "BLOW-THROUGH" DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

### 3 ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

### 4 QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

### 5 FOR FINISHED INTERIORS

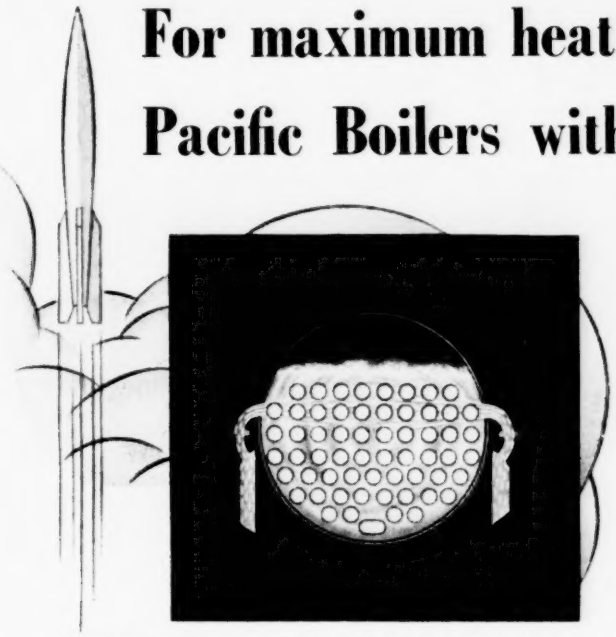
Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

***MANY OTHER OUTSTANDING FEATURES.***

**WRITE FOR BULLETIN AC-238**

## KRAMER TRENTON CO. • Trenton 5, N.J.

# For maximum heat transfer...
# Pacific Boilers with Jet-action Circulation!



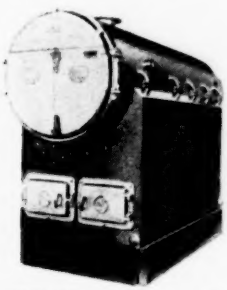
**Jet-action Circulation** is created by Pacific Circulating Connections. Their special design forms hot water and steam from the water leg into a jet stream trained directly on heating tubes. Insulating steam bubbles on the tubes are swept into motion producing a state of turbulence that provides maximum heat transfer.

Higher efficiency, lower maintenance costs, longer life—you get them *all* when you specify Pacific Boilers with Jet-action Circulation!

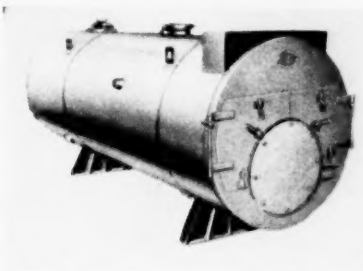
Jet-action Circulation, available in most types of Pacific Commercial Boilers, creates maximum heat transfer. It sweeps insulating steam bubbles away from heating tubes, keeps your entire boiler system at high turbulence. As a result, your installations use fuel more efficiently, respond at high speed when temperature changes are needed.

Pacific Boilers with Jet-action Circulation meet all ASME and SBI requirements. Built entirely of flange-quality steel, they're electrically welded for greater strength and safety. All, except Scotch Marine, are available in three types of construction: one-piece, with solid Circulating Connections; two-piece, with removable shell; three-piece, with split firebox.

Get complete information . . . call your local Pacific representative, or send coupon today!

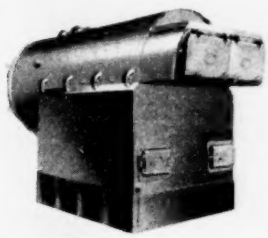


**Pacific High Firebox Boilers** are furnished with steel bases or with steel bearing angles welded to the firebox for erection on brick settings.

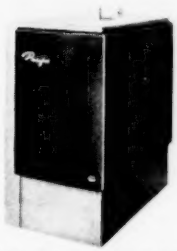


Built entirely of flange-quality steel, **Pacific Scotch Marine Boilers** feature extra-large combustion chamber, lower water line and flush-front design.

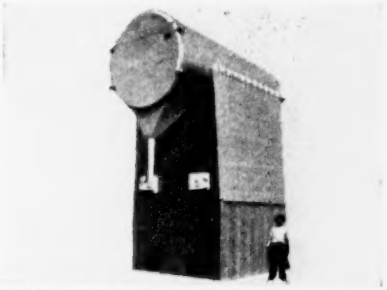
Component parts of **Pacific Split Firebox Boilers** are small enough to pass through skylight, window or doorway. Available in all types but Scotch Marine.



**Pacific Front Smoke Outlet Boilers** come in oil-, gas-, stoker- or hand-fired models. Built, inspected and tested under supervision of leading insurance company.



**Pacific Plate Flue Residential Boilers** are built of flange-quality boiler plate. Exclusive Pacific design assures long life and trouble-free service.



If your job takes a **special design** your Pacific representative is always ready with needed engineering help. Send the coupon for further information!

Designed Constructed and Stamped in Accordance with **ASME** Code

SBI

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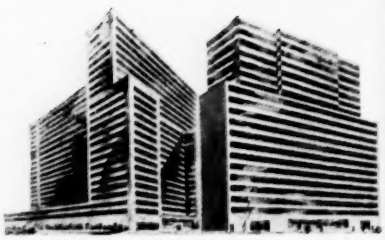


The type it installed in Philadelphia's luxurious Rittenhouse Claridge and Savoy?

The advanced system recommended for the St. Francis Hospital in Lynnwood, Calif.?

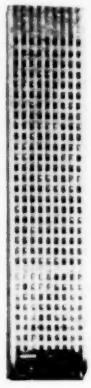
The system chosen for guest comfort in Cincinnati's famed Netherland-Plaza Hotel?

# Which York system of air conditioning should you buy?

The engineering feat accomplished for New York's Empire State Building?

The battery of Turbo Compressors installed in the great new S.S. *United States*?

The all-year-comfort system chosen for the beautiful Esso Building in New York City?



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**That's because York has taken the compromise out of air conditioning.**

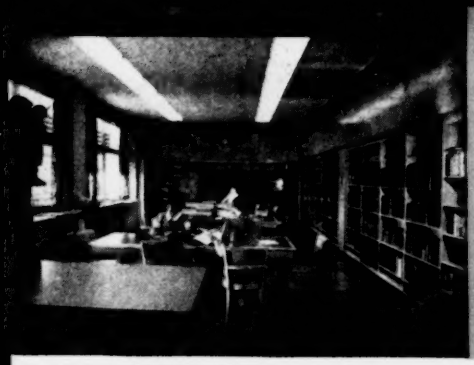
You see, York Engineers work with a wide range of equipment. They do not have to compromise—and try to fit a rigid system to a building or fit the building to a system.

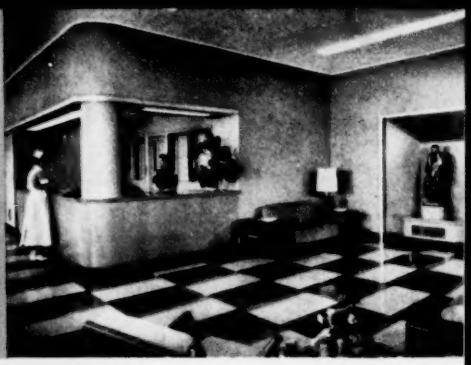
They can recommend with broad impartiality the installation that *precisely* suits the particular requirements of the building you are air conditioning. The result, of course, is better performance, longer life, at lower initial and operating cost.

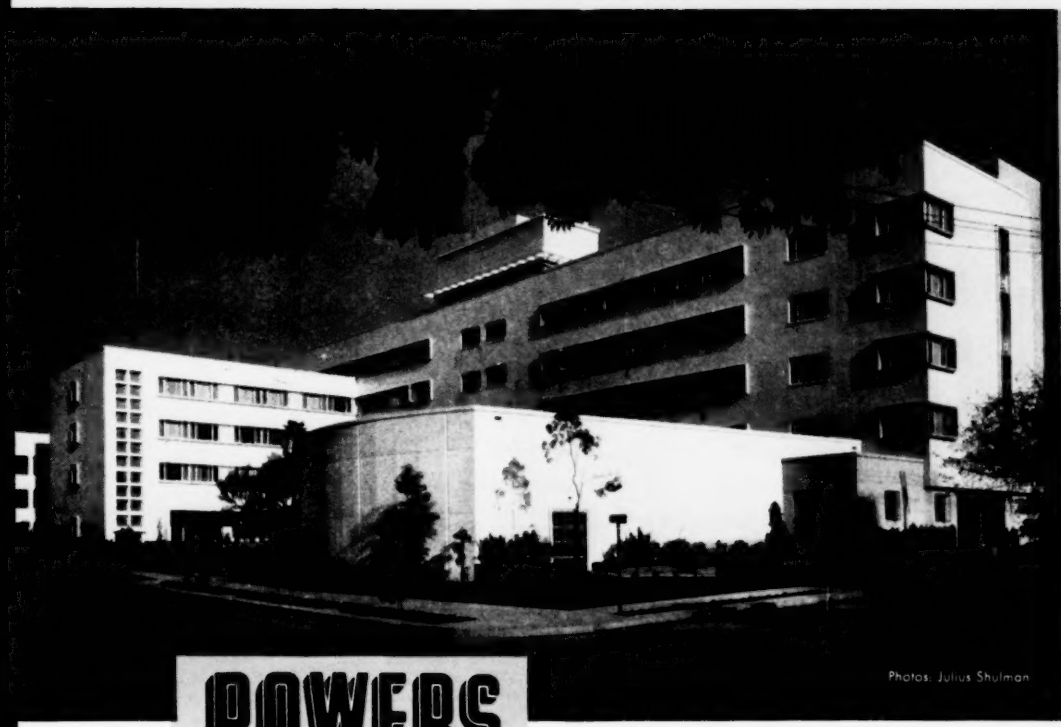
There is a York Engineering Office near you. Give them a call. There is no obligation, naturally. Or write directly for details to York Corporation, York, Pa.

**YORK** AIR CONDITIONING AND REFRIGERATION
**HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885**

York refrigeration air conditioning







Photos: Julius Shulman

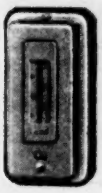
Architects
AUSTIN, FIELD & FRY

Mechanical Engineer
SAMUEL L. KAYE

Heating and Plumbing Contractor
SWAN PLUMBING SERVICE

All in Los Angeles, Cal.

# POWERS
## TEMPERATURE CONTROL



Left: Room Thermostats pneumatically operate control valves and dampers of heating system.

88 Thermostatic Water Mixers insure comfortable, safe showers, stop waste of hot and cold water.

(b17)

## Selected for the Heating and Ventilating System and 88 Showers in this Outstanding College

One of the most notable schools designed to attract desirable students for a career in nursing is St. Vincent's $2,000,000 College in Los Angeles. Every possible modern facility for education, health, recreation and comfortable living has been provided. Quality of the mechanical equipment is on a par with the excellent design of the building.

Comfortable room temperature and fuel economy is assured by a Powers Pneumatic System of Control. For utmost comfort and safety each shower bath is regulated by a Powers Thermostatic Water Mixer.

When you want dependable low maintenance temperature control call Powers. No other firm has such a complete line of controls for heating, air conditioning and water temperature in all types of buildings.

Established in 1891 • **THE POWERS REGULATOR COMPANY** • SKOKIE, ILL. • Offices in Over 50 Cities

# *Here's PROOF of Acme acceptance throughout the refrigeration industry*

For over thirty years ACME has been producing air conditioning and refrigeration products preferred by original equipment manufacturers of commercial and industrial refrigeration and air conditioning equipment.

ACME's background as heat transfer specialists means dependable, highly efficient fluid chillers, freon and ammonia condensers, oil separators, heat exchangers, liquid receivers, evaporative condensers, cooling towers, and allied products for original equipment manufacturers and general distribution.

Products of the outstanding manufacturers whose trademark appears on this page depend on ACME to maintain their high standards by using components from the complete Acme line.

## These Original Equipment Manufacturers . . .

WORTHINGTON

Carrier

GENERAL ELECTRIC

TECUMSEH

Lehigh BLU-COLD

bryant

Chrysler Airtemp

Curtis REFRIGERATION AIR CONDITIONING COMMERCIAL

TRANE

MILLS INDUSTRIES, Incorporated

Westinghouse

Copeland DEPENDABLE Electric REFRIGERATION

Vogt FOR BETTER REFRIGERATION

USAIRCO

SCHNACKE

Baker AIR CONDITIONING and REFRIGERATION

BRUNNER SINCE 1905

## Select component parts from this COMPLETE *Acme* LINE

**DRY-EX* WATER CHILLERS**

More than 700 combinations from which to choose, assuring you of the most efficient chiller operation obtainable. Capacities from 5 to 260 tons for all common liquid chilling applications.

**ACME CONDENSERS**

More than 120 models and standard sizes of Freon and Ammonia shell and tube, and shell and coil types. Capacities from ½ to 700 tons.

**BLO-COLD* INDUSTRIAL UNIT COOLERS**

For vegetable storage, packing plants and low temperature installations. 5 distinct series for either Freon or Ammonia with more than 260 combinations.

**ACME COOLING TOWERS**

Available for use where compactness counts. An all metal tower completely galvanized for long life. Capacities from 3 to 60 tons.

**ACME OIL SEPARATORS**

A complete line of Freon or Ammonia separators for ¼ to 100 ton systems.

**ACME HEAT EXCHANGERS**

Compact, efficient Freon suction and liquid line heat exchangers designed for systems from 3 to 200 tons.

**ACME LIQUID RECEIVERS**

More than 70 standard sizes for Freon, Ammonia, or other refrigerants.

**HI-PEAK* WATER COOLERS**

Seven standard sizes providing large storage capacity and all non-ferrous surfaces in contact with the fluid.

**ACME EVAPORATIVE CONDENSERS**

For Freon or Ammonia. More than 30 models with capacities up to 1,250,000 BTU/hr. from which to choose. Your choice of either copper tubing or pipe coils. Completely hot-dipped galvanized after fabrication. Capacities from 4 to 130 tons.

**FLOW-COLD* PACKAGED LIQUID CHILLERS**

A factory assembled, pre-tested liquid chilling unit shipped ready for instant installation. Balanced performance from matched Acme components for systems of 2 to 15 tons. Also used as a Heat Pump providing both heating and cooling for year-round air conditioning.

**FLOW-TEMP* REMOTE ROOM CONDITIONERS**

Designed for the modern recirculated hot or cold water air conditioning systems. Whisper quiet with variable air recirculation permits efficient individual zone control.

*Trade Mark

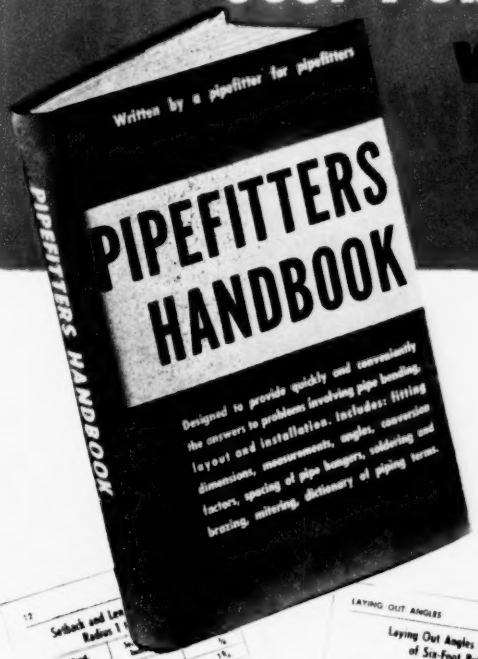
# ACME INDUSTRIES, INC.

*Continuously Serving the Air Conditioning and Refrigeration Industry since 1919*

ACME AIR CONDITIONING REFRIGERATION

JACKSON, MICHIGAN

# Just Published! A HANDBOOK WRITTEN ESPECIALLY TO SOLVE AND SIMPLIFY PIPEFITTING PROBLEMS


Written by a pipefitter for pipefitters
PIPEFITTERS HANDBOOK
Designed to provide quickly and conveniently the answers to problems involving pipe bending, layout and installation. Includes: fitting dimensions, measurements, angles, conversion factors, spacing of pipe hangers, soldering and brazing, mitering, dictionary of piping terms.
PIPEFITTERS HANDBOOK

Laying Out Angles by Use of Six-Foot Rule
Clearance Between Pipe Lines to Provide for Turning of Screwed Fittings
Setback and Length of 45° Bends
Mitering Pipe Around a Circle

**PIPEFITTERS HANDBOOK** is written especially to enable pipefitters quickly to solve problems met either in the shop or in the field in connection with pipe bending, mitering, layout, threading, etc. The author, Forrest R. Lindsey, is a union pipefitter with over 35 years' experience. A large part of the book is taken directly from original tables which he has developed over a long period of time as a result of his experience with practical problems. These tables eliminate the necessity for making lengthy calculations by giving immediate answers to all kinds of pipefitting problems. Typical pages shown at the left illustrate the intensely practical nature of the information in the PIPEFITTERS HANDBOOK. The actual size of the book is 4" x 7", and it is bound in flexible maroon Fabrikoid so that it will fit conveniently into a pocket. It is printed in large type on durable paper, so that smudging with soiled hands will not obliterate the characters.

## Page After Page of Valuable, Practical Data!

**PIPEFITTERS HANDBOOK** provides information on all the following subjects: Pipe Bending—Offsets—Mitered Joints—Standard Pipe Dimensions and Thread Data—Screwed Fittings—Butt Welding Fittings—Flanged Fittings—Valves—Solder Joint Fittings—Other Pipe Data—Miscellaneous Data on sheet metal, properties of steam, melting points of metals, etc.—Mathematical Tables, Conversion Factors, Use of Trigonometry—Pipefitters Dictionary . . . a total of 282 time-saving, work-improving pages of information.

## Examine this New Handbook Free!

No matter how much experience he has, every pipefitter will find the PIPEFITTERS HANDBOOK useful. It will repay many times its cost by speeding up and simplifying the solution of all kinds of everyday problems—and unusual ones, too! Just use the convenient coupon below to order copies of this new book for every member of your organization engaged in pipefitting. We pay the postage.

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H-V—8/53

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## *factory assembled and tested*

This Iron Fireman firing unit is much more than just a burner. It's a complete combustion system, including burner, automatic controls, fuel system and forced draft air supply integrated into a single balanced package unit. It is readily applied to Scotch marine or other types of high or low pressure boilers by bolting to the boiler front.

To the user this means an attractive saving in installation time and cost. But even more important, it means a factory assembled and tested unit instead of a locally assembled job. It means dependable performance and high operating efficiency, with substantial fuel savings. It's the *smart* way to modernize your boiler room.

See your Iron Fireman dealer or write for further information to Iron Fireman Manufacturing Company, 3073 West 106th Street, Cleveland 11, Ohio. In Canada, write 80 Ward St., Toronto, Ontario.

1. Assembled and tested at factory instead of on the job.
2. Applicable to practically all types of boilers.
3. Continuous high combustion efficiency.
4. No high stack—requires only vent pipe.
5. For either gas or oil firing. Combination burners quickly shifted from one fuel to the other.
6. Burns low-cost heavy oils (No. 6 or any lighter grade).

THE IRON FIREMAN

# Iron Fireman®

**Gas, Oil, Coal firing equipment for heating, processing, power**

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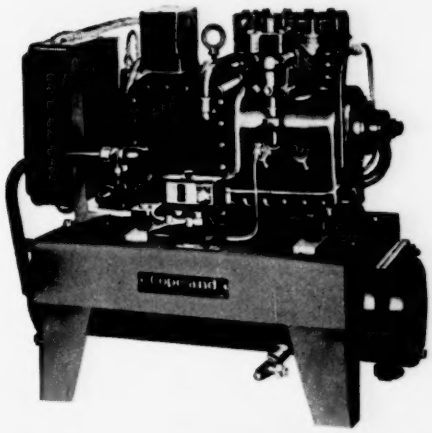
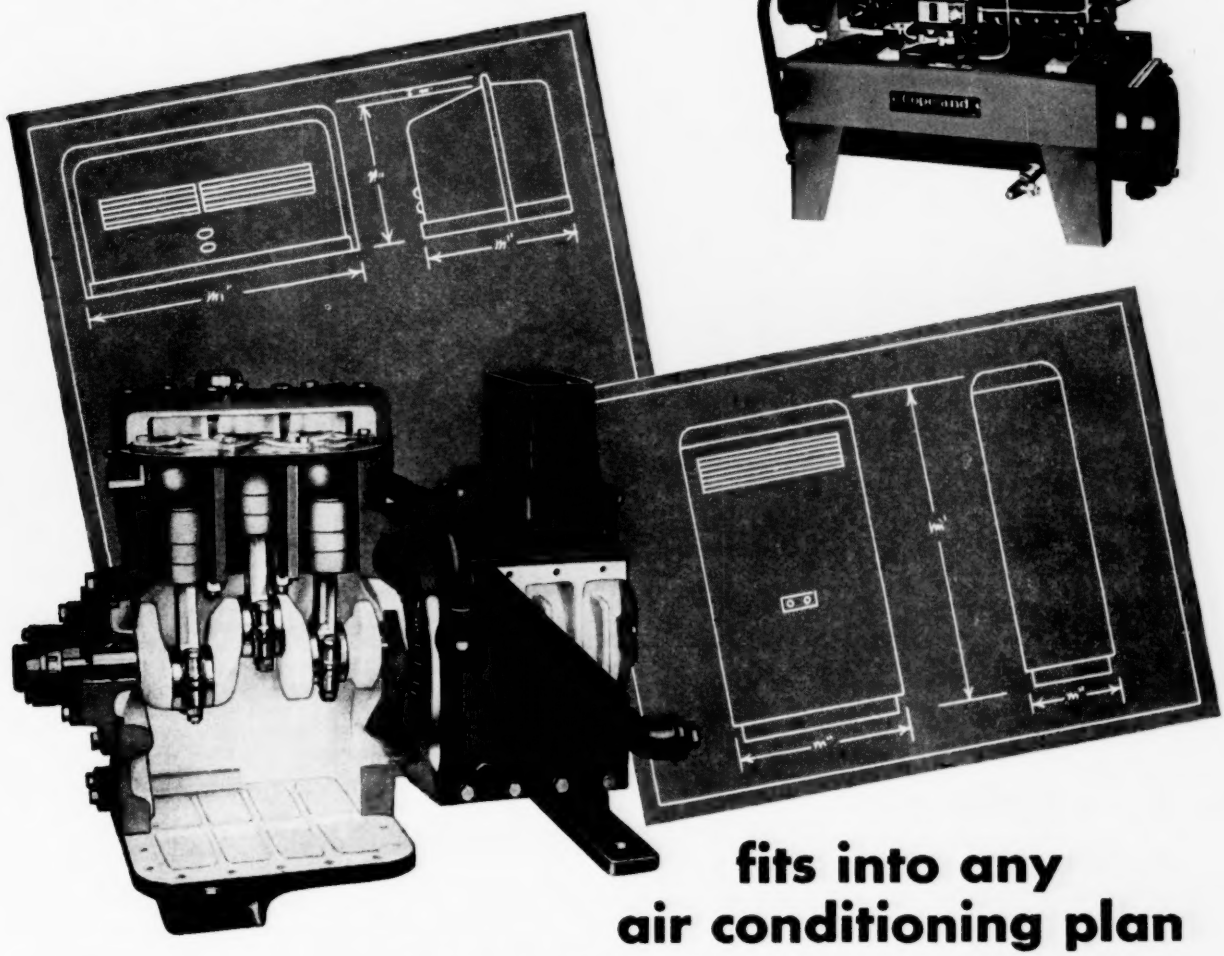
THE *Accessible* HERMETIC





## fits into any air conditioning plan

Cutaway of 7½ H.P. COPELAMETIC Motor-compressor

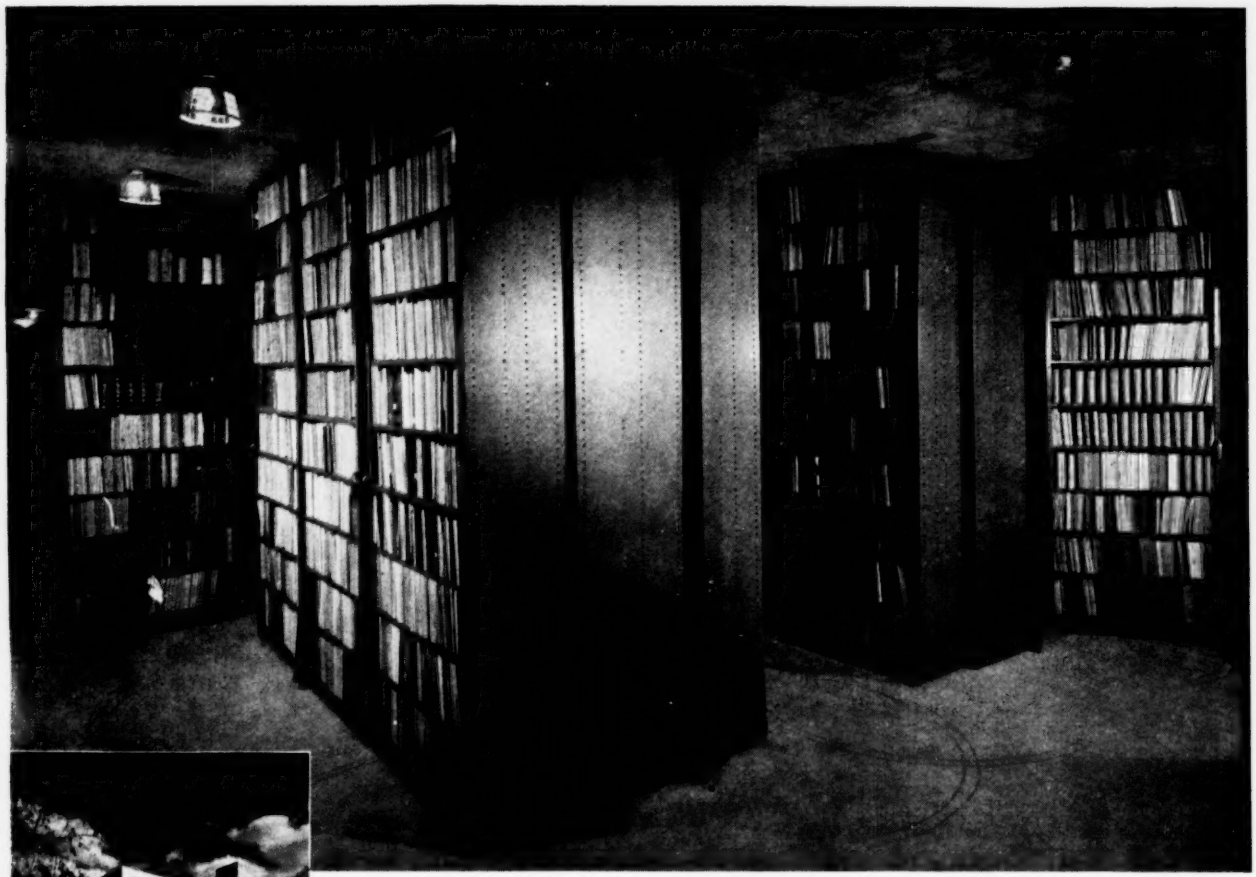
Whether it's a room air conditioner, a large package unit or a huge factory system, COPELAMETIC is your answer to the question "Which refrigeration unit shall I recommend for the air conditioning system?" COPELAMETIC has become the standard of comparison for dependability, ruggedness, compactness and long life. Your clients will appreciate the COPELAMETIC design which eliminates belts, seals and manual oiling . . . reasons for 9 out of 10 service calls. Better yet, they'll appreciate the practical feature of accessibility.

Air-cooled, remote COPELAMETICS are built from ¼ thru 3 HP. There are also water-cooled, remote units from ⅓ thru 7½ HP. Self-contained COPELAMETICS are available for all applications. Write for Condensed Catalog C-52.

REFRIGERATION UNITS
(OPEN TYPE AND COPELAMETIC)
WATER COOLERS

**Copeland**
DEPENDABLE *Electric* REFRIGERATION

**COPELAND REFRIGERATION CORPORATION, SIDNEY, OHIO**



*A portion of the revolving book cases at the Midwest Inter-Library, at Chicago where more than 36,000 lineal feet of books and documents are housed to serve the research needs of fifteen institutions.*

*Architects for the building:* SHAW, METZ AND DOLIO.

**CLEAN AIR** preserves the perishable pages and covers of hundreds of thousands of books and technical and historical documents in the new

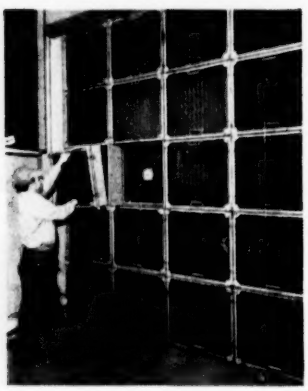
## MIDWEST INTER-LIBRARY CENTER

The designers of the new Inter-Library Center of Chicago specified the AAF ELECTRO-PL ELECTRONIC AIR FILTER to protect the more than 36,000 lineal feet of books, documents and periodicals deposited in the new Inter-Library building against dust discoloration and smoke damage caused by impurities in ordinary air.

This huge research library serves fifteen institutions and is a clearing house for material needed in almost every phase of scholastic research. The new center provides a speedy central source of information and technical data and eliminates duplication of source material among the participating institutions. To assure absolute protection for the valuable documents housed in the new library—*Clean Air* was a necessity.

AAF—manufacturers of the only *complete* line of air cleaning equipment in the world . . . was able to supply the ideal equipment for this building.

If you have an air cleaning problem, the experience of American Air Filter engineers can be of help to you. We welcome your inquiries and will supply you with complete information and Experience Reports without obligation. Please address your requests to American Air Filter Company, Inc., Louisville 8, Kentucky.



*This illustration shows a part of the ELECTRO-PL Dry-Type electronic air filter installation which delivers 25,000 c.f.m. at the new Midwest Inter-Library Building in Chicago.*
*ELECTRO-PL is the only electronic air cleaner with the famous AAF "double protection" feature. If a power failure should occur in a building — the ELECTRO-PL will continue to function as one of the most efficient dry-type filters ever developed.*

*Expect the Best from . . . . .*

American Air Filter
COMPANY, INC.

AAF

294 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

# "Your valve is just a weeper!"

*(Imagine how we felt!)*

That was the complaint entered by the irate voice at the other end of the phone. He was slurring one of our prized temperature relief valves: so we hurried right out to see what was eating the guy.

What we found caused a lot of head scratching. The fellow was righter than right about the weeping, but when we tested out the valve we found it was opening just as it should—at 188° F. The trouble was that it just barely opened, and then, as our friend said, just sat there and wept.

So there's your 32-dollar question: When is a temperature relief valve doing right and wrong at the same time? The answer is that any valve with a dip tube—ours or anybody else's—can become a weeper. But that's getting ahead of the story; let's see what causes this.

First note that the valve under suspicion was one of our combined T&P Relief Valves. Its thermostatic element starts to open at 188° F., is fully opened at 208° F., and closes when the temperature recedes to 183° F. So it takes a 20-degree rise, after it starts, to open it wide.

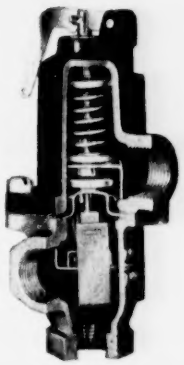
Now, as we said, this was a dip-tube type—the type that is affected by the temperature about five inches down in the tank. So the water in that zone had reached 188 degrees and had opened the valve just far enough to discharge a small trickle. This caused just enough cold water to flow into the heater to balance the heat dissipated . . . and keep *right on doing it.*

In other words we had a state of equilibrium: Not enough heat to open the valve wide enough to produce (in turn) sufficient cooling to reseat it. Such a condition can of course go on and on—the relief valve simply acting as a heat metering valve—yet the valve would be simply doing what it was designed to do!

Cases like this are not the rule; but they are frequent enough to make us recommend our temperature relief valve *WITHOUT* the dip tube for practically all applications. When the thermostatic element is in the valve body, the temperature of the hottest water in the top of the tank may reach 208° F. before the water surrounding the element reaches 188 degrees, but when the valve *does* open there is enough accumulated heat to open it wide; quickly cool the contents of the tank, and reseat the valve. This is what you want . . . prompt and complete functioning of the valve; not service calls about weepers!

Remember that in the McDonnell T&P Valve a fixture connection is provided right in the valve; so the hot water passes over the thermostatic element every time water is withdrawn. This offers the advantage of service free operation without the drooling.* For your next job use a 202 series valve as described here . . . it gives the owner *maximum* protection on both the pressure and temperature side. A new bulletin tells the whole story.

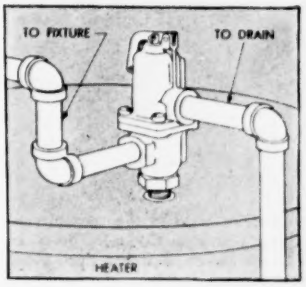
## The ultimate in T&P Valves



## McDONNELL No. 202

Here is the perfect combination you have been needing for those tanks and heaters. It combines two valves you know to be the best of their types—our No. 230 pressure relief valve and our 201 temperature relief valve. This means that on the pressure relief side the No. 202 is *steam rated* in Btu's per hr. . . . and on the temperature side it embodies the accuracy of response to the McDonnell No. 201 and has the ¾" tapping to fixtures which saves time and money.

**Opening pressure: 125 lbs.**
**Pressure rating: 644,000 Btu/hr.**
**Temperature range: 188°-208°F.**
**Temperature rating AGA listed: 725,000 Btu/hr.**
**All connections: ¾" tappings**




Note fixture tapping which brings service water through body of valve assuring control of water temperature as used.

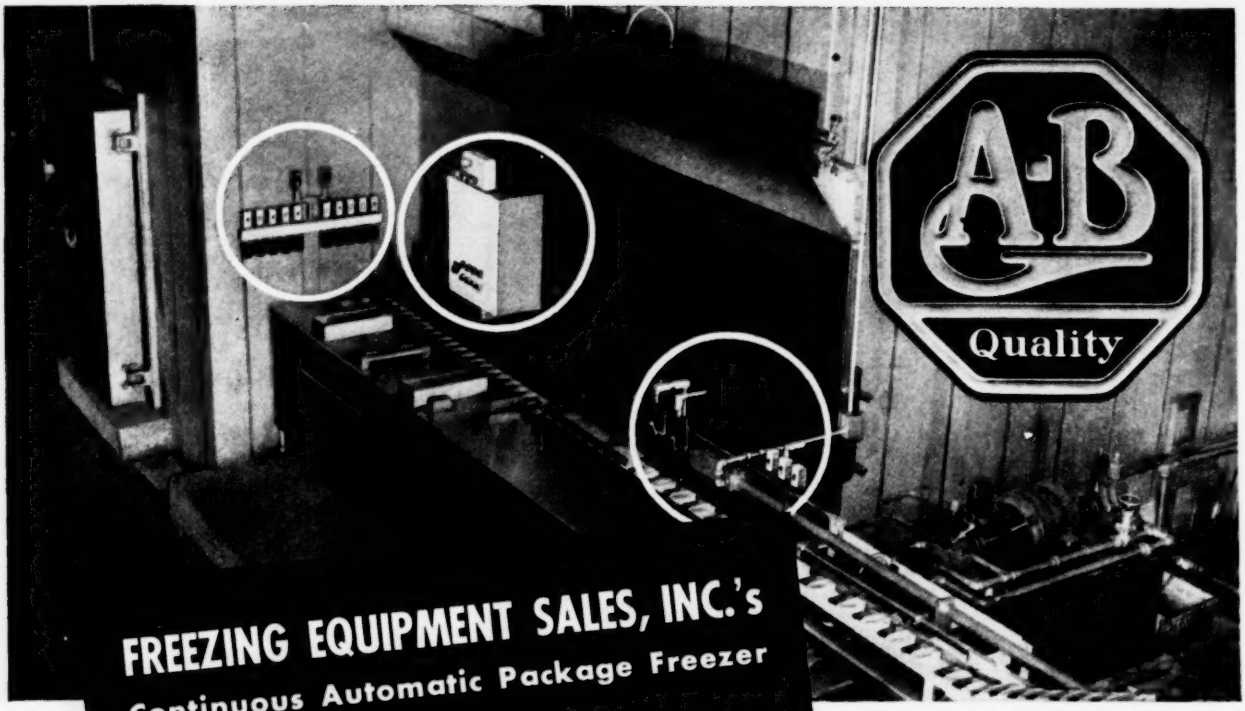
* Our dip tube T&P valve (No. 203) is illustrated opposite. If it is wrong, why do we make it? That's a good question. The first answer is that it isn't wrong itself; it can just "get in" wrong. We make it because certain specifications call for it—apparently for special applications where it is desired to carry temperatures clear up to the setting of the valve, in which case, there is a questionable assumption that the valve operation should be governed by temperature down in the tank. This is a controversial point, but we are continuing the dip-tube pending further engineering analysis.

**McDONNELL & MILLER, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.**

*Doing One Thing Well*

*Your Jobber Stocks Them*

# McDONNELL *Boiler Safety Devices*



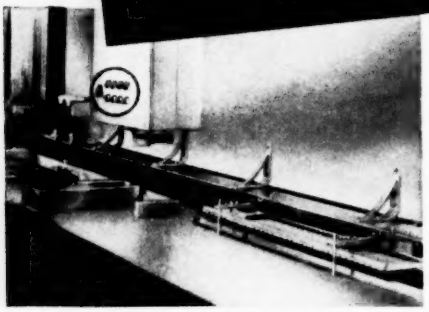

# FREEZING EQUIPMENT SALES, INC.'s

## Continuous Automatic Package Freezer

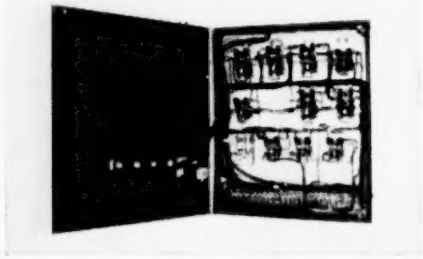
*equipped with*

## ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

The continuous automatic package freezer for fast food freezing, shown above, is designed by the Freezing Equipment Sales, Inc., of York, Pennsylvania. Circles enclose A-B Motor Controls in panel, limit switches, manual switches, and push buttons.



Close-up view of the special control panel showing the Allen-Bradley Bulletin 353 Drum Selector Switch and the eight oiltight control units in the cover.



Interior view of the special control panel showing Allen-Bradley Controls: drum selector switch, oiltight transformer type push button, pilot lights, and selector switches in the cover; ten Bulletin 700 control relays within the cabinet.

Why are Allen-Bradley starters so popular for refrigeration and air-conditioning service? . . . because they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick...no jumpers to break. You install them...and forget them!

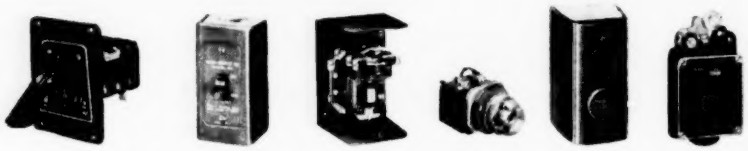
No contact maintenance . . . Allen-Bradley silver alloy contacts never need cleaning, filing, or dressing.

Dependable overload relays . . . Allen-Bradley thermal relays are accurate and always dependable . . . even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.

### Allen-Bradley Controls Used in This Freezing Unit



Drum Selector Switch | Manual Switch | Control Relay | Transformer Type Push Button | Push Button | Limit Switch

# ALLEN-BRADLEY QUALITY MOTOR CONTROLS

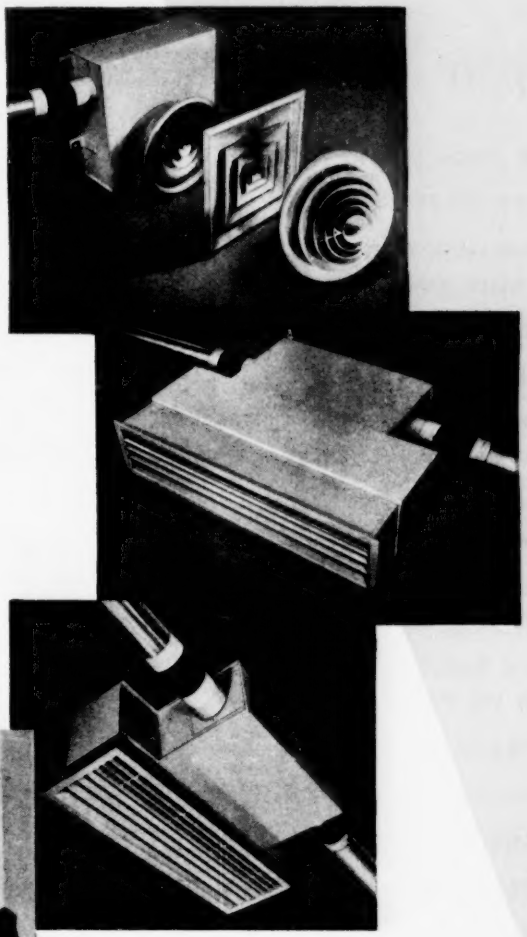
# *Pick your package*

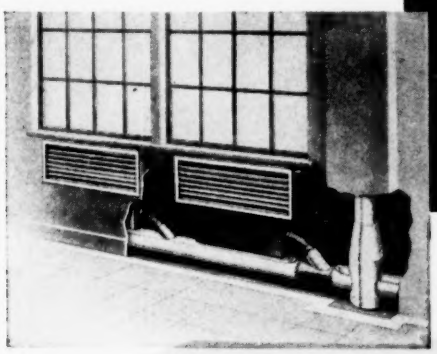
**ANEMOSTAT HIGH VELOCITY ASPIRATING UNITS**

Here's Anemostat's answer to the problem of high velocity air distribution.

Each of these easy-to-install packaged units consists of a combination static pressure and velocity reducing valve, plus sound attenuating chamber and one of several types of Anemostat draftless air diffusers. A wide choice to meet all your engineering and architectural requirements.

For top flight performance in high velocity air distribution systems, pick your package from Anemostat's line of tried and proven high velocity units. Write for High Velocity Manual No. 48 for details.





**ANEMOSTAT®**

**DRAFTLESS *Aspirating* AIR DIFFUSERS**

**ANEMOSTAT CORPORATION OF AMERICA**

**10 EAST 39th STREET, NEW YORK 16, N. Y.**

**REPRESENTATIVES IN PRINCIPAL CITIES**

*"No Air Conditioning System Is Better Than Its Air Distribution"*

# *Now!* A Proven New Concept in Furnace Controls

## *Compare These Fan and Limit Control Features:*

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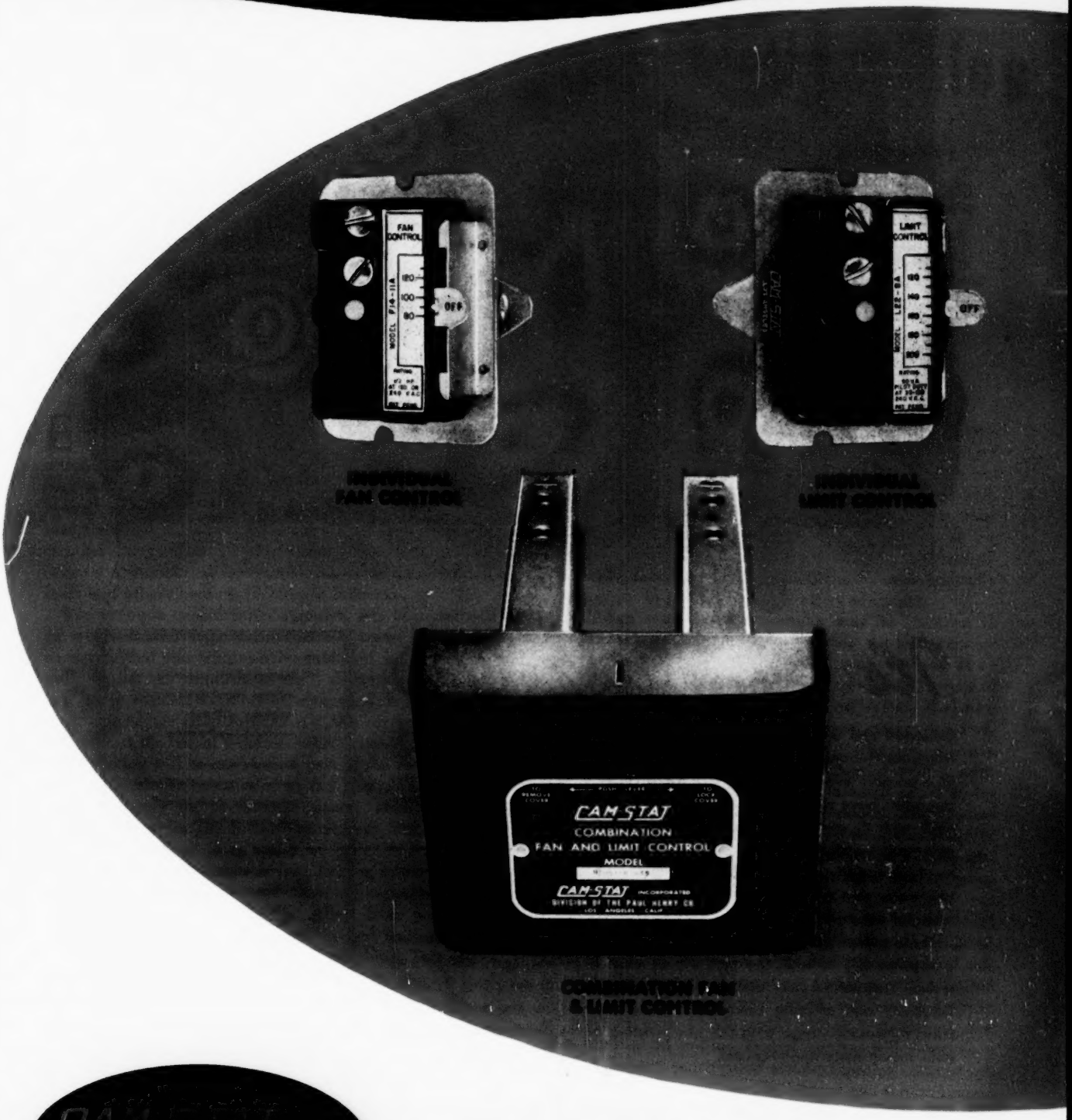
2. SIXTY DIFFERENT COMBINATIONS
3. AVAILABLE FOR INTEGRAL OR PLENUM MOUNTINGS
4. WITH OR WITHOUT CONDUIT HOUSINGS
5. INDIVIDUAL CONTROLS OR IN COMBINATION
6. WIDE VARIETY OF SETTINGS AND DIFFERENTIALS, BOTH FIXED & ADJUSTABLE
7. AVAILABLE WITH 7″ OR 3″ BIMETAL ELEMENT EXTENSION
8. PRECISION CALIBRATIONS AND DIFFERENTIALS —ACCURATELY MAINTAINED
9. HIGH RATING—½ HORSEPOWER AND 90 VOLT AMPERES
10. EXTREME SENSITIVITY
11. SNAP ACTION SWITCH—CLEAN MAKE & BREAK
12. HIGHEST QUALITY
13. LISTED BY UNDERWRITERS' LABORATORIES, INC.

*and*

14. FOR THESE FEATURES, THE LOWEST PRICES IN THE CONTROLS INDUSTRY

Complete application testing available to furnace manufacturers, without obligatio

# *Complete flexibility with highest quality*




INDIVIDUAL FAN CONTROL

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COMBINATION FAN & LIMIT CONTROL

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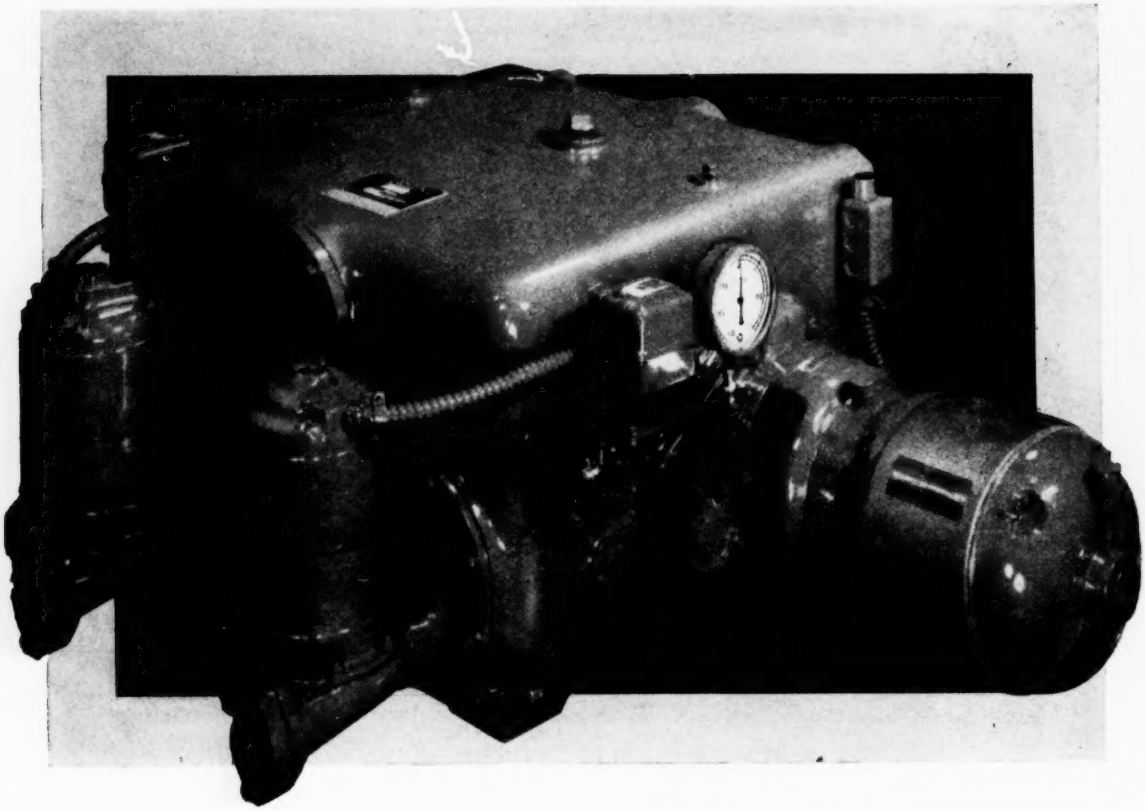
NO THERMOSTAT CAN EXCEL CAM-STAT'S RECORD OF FINE SERVICE

# THIS NEW VACUUM HEATING PUMP

## HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



*It's the Nash* CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

**NASH ENGINEERING COMPANY**
**437 WILSON, SO. NORWALK, CONN.**

# Problems in Residential Air Conditioning

WALTER R. YEARY
Air Conditioning Division
WESTINGHOUSE ELECTRIC CORP.
Hyde Park, Mass.

**A presentation of engineering and mechanical problems that followed a more general use of air conditioning in residences.**

EXCESSIVE temperatures during the summer of 1952 did more to arouse nationwide interest in air conditioning than all other factors prior to that outstanding heat wave. As a result, a rapidly developing field has opened in residences. However, contrary to some opinions, air conditioning will not bring about drastic changes in residential construction although it has uncovered a number of new problems, some in the house itself and others because of outside influence.

For example considerable attention has been focused on windows with suggestions that the house be without windows, that the windows be mounted higher in the wall, or that the windows be rigid or stationary. Living in a house without windows or with small, high mounted ones, can be far from satisfactory. We certainly do not recommend the use of windows which cannot be opened. Since cooling will be used only a part of the year, healthy ventilation for the remainder of the year would depend almost entirely on mechanical means alone. This is especially true for the in-between seasons when neither cooling nor heating is in use.

Flat roofs may be seen more often as residential air conditioning advances, as a result of engineers' eagerness to get the most possible cooling effect from equipment used. Condenser water may be discharged on the roof in one of two ways to reduce the roof sun load. Two methods of piping condenser discharge water to a gable roof for reduction of solar radiation load are shown in Fig. 1. The water may be sprayed on and evaporated, or it may be spilled into a roof pool to provide additional insulation. Also, white painted roofs are becoming popular as fairly good reflective surfaces for direct sun load. Marble chips are gaining wide spread popularity throughout the Southwest as inexpensive and reasonably easy to apply roof solar radiation reflective material.

Chimneys, windows, dormer windows, nurseries, closets, dining rooms, attics or basements need not give way to air conditioning. People want these features not only in today's home but in tomorrow's designs as well. Air conditioning has no direct connection with these features and must not be made the whipping-post for their omission. There is no sound reasoning to substantiate claims that home construction must follow radically new designs in order to include air conditioning.

Although more air conditioning may be installed in new homes than in older homes during the next year or two, such a condition will definitely cease to exist at or near the end of that period and the market will swing to older homes. It is estimated that by early 1955 the older homes will represent 65% of the sure market for residential air conditioning. At present, older homes are a ready market for the individual residential cooling unit.

In most of these older homes, it is much easier to install ducts than in the newer ones for closets, utility rooms and basements are more common. These spaces simplify the problem of concealing stacks and risers without cutting into walls and ceilings and eliminate the necessity for exposed lengths of duct.

Figure 2, based on figures supplied by the National Warm Air Heating and Air Conditioning Association, Cleveland, Ohio, gives the totals and percentages of different types of existing warm air furnaces in the United States. The fact that forced warm air heating systems account for only 11.6% or 5 million installations, out of a total of 43 million heated houses, will come as a surprise to most heating and air conditioning contractors. Furthermore, few realize that there are approximately 7½ million gravity warm air heating systems in use in this country today, the majority very old and due for conversion at an early date.

**Mr. Yeary, headquarters application engineer for self-contained air conditioning products, has been with Westinghouse Electric Corporation at Hyde Park, Mass. since September, 1953. Following three year's service as an officer in the Signal Corps, he was a field engineer for the Air Conditioning Division of General Electric Company and in 1947 became service manager for a major G-E distributor. In 1950, he joined Westinghouse as an air conditioning application engineer and was placed in charge of the Washington, D. C., field office. Three years later he was transferred to Hyde Park.**

## Types of Residential Equipment Available

There is a variety of types of air conditioners which may be used in homes. Some units were designed specifically for residential application; some have advantages which others lack; some will be definitely cumbersome and expensive. Other types may prove very unsatisfactory.

Air conditioning systems for residences include the use of the following:

(1) Window and console room coolers.
(2) Individual or single cycle packaged units.
(3) Combination heating and cooling packaged units.
(4) Store coolers.
(5) Heat Pump.
(6) Field-assembled or built up systems.

## Advantages of Equipment

*Window or room console coolers.* Completely conditioning a home with window or room console coolers is usually very expensive and sometimes presents a problem from the service standpoint. One unit per room is usually required and each unit installed adds another service problem. This in no way reflects on the individual merits of room and window coolers because, if properly installed, they will provide satisfactory cooling.

*Single cycle residential units* are proving to be the answer to many cooling problems in residences. Small in size and easily adaptable to existing or new housing, a great future is foreseen for them for these units should be popular.

*Combination heating and cooling units* will find a ready market in new housing, especially in the South, Southwest and West. However, many owners of older houses are not going to yank out good heating systems so that they may install combination units just to gain cooling.

*Store or commercial coolers* do a wonderful job of air conditioning. A disadvantage to their use is high cost and enormous bulk.

*The heat pump* will solve a lot of home heating and cooling problems if and when manufacturers, and power and utility companies, have an answer to the problem of high operating costs.

*Field-assembled or built-up jobs for residences* may represent such a small percentage of business as to make it negligible.

In general, we believe the single and combination unit air conditioners have by far the brightest future in home cooling.

## Accessories and Utilities

One of the most important utility problems from the availability standpoint, is that of condenser water for city water is usually too expensive to be wasted to the sewer. With water shortages, usage regulations, and undersized municipal mains and sewers, manufacturers are compelled now to develop either an inexpensive water cooling tower or an acceptable unit with an air cooled condenser.

Few persons want a large, unsightly water tower standing near the house. A few contractors have solved this problem by use of an ingenious tower made to resemble a chimney; others are using water spray pools and fountains. But these types of water cooling devices come high in price and probably will not start an accepted trend.

Well water is fine, but well drilling is expensive. Furthermore, wells have a damning habit of running dry during the summer when the water is needed most. Sometimes the neighbor down the street may drill a well, and obtain an abundant supply of water but at the expense of your well going permanently dry. Scale, sludge, biological deposits, corrosion and insoluble material are all possible factors against the satisfactory use of well water. A well capable of delivering an ample supply may be unfit for constant use as a condenser water because of water quality.

The quality of well water expected depends, to a large extent, upon the geographical location of the well. Proper analysis of a water sample from a nearby well will usually be sufficient to determine the usability of the water in any particular locality.

## Household Wiring

Few of the older homes have wiring facilities adequate to handle the additional load of an air conditioner. This means that modifications are also necessary in the home with an increase in wire size and current capacity. Heavier service drop, fuse, and switch equipment must be provided.

Such overhaul and modifications are expensive and this expense will often determine whether or not a sale can be made. It is never good practice (1) to take a chance on improper wiring and (2) it is contrary to the codes to permanently overload any power circuit. However, it may be necessary to minimize the amount of re-wiring if the job is to be sold at a reasonable price.

## Residential Cooling Equipment Selection

Just any self-contained unit is not the answer to the residential demand. There are many factors which go into the selection of such equipment, that are not normally used in calculating commercial and industrial installations. These factors are necessary to adjust the load calculations so that selection of properly sized units will be possible at the lowest practical cost to assure customer satisfaction. In the past, contractors have been using the instantaneous heat gain estimate method which results in incorrect unit size and high cost.

Experience indicates that the use of instantaneous heat gain estimate methods for residential applications, without applying a correction factor, gives an excessive cooling load estimate resulting in oversized units, higher in-

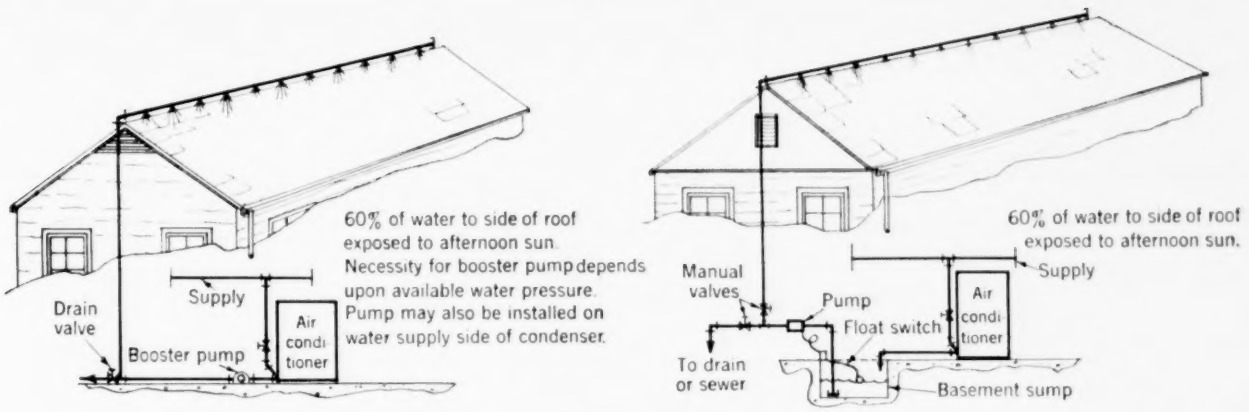

60% of water to side of roof exposed to afternoon sun.
Necessity for booster pump depends upon available water pressure.
Pump may also be installed on water supply side of condenser.
Drain valve
Supply
Booster pump
Air conditioner
60% of water to side of roof exposed to afternoon sun.
Supply
Manual valves
Pump
Float switch
Air conditioner
To drain or sewer
Basement sump

Fig. 1. Two methods of piping condenser discharge water to a gable roof for reduction of solar radiation load.

stallation costs, and erratic humidity control due to long off-cycles.

Extensive research has established that the mean indoor temperature of an uncooled, unventilated, normally closed and occupied house, seldom varies more than 7F even though outside variations range as high as 20F to 25F. The time lag of heat variation "follow-up"—inside temperature equaling outside—is normally so slow in the average house, that summer maximum inside temperature usually occurs between 8 and 10 p.m. Maximum inside conditions occur *after* the outdoor temperature has started to decline because of sundown, and several hours after maximum sun load.

The same extensive tests have shown that a cooled, normally closed and occupied house exhibits the same variations since the lag factor does not discriminate between heating and cooling. Therefore, this heat lag factor must be considered where calculating heat gain loads for residential applications.

The ability of a house, at such conditions to hold closely to a certain inside temperature, even though outside variation may be considerable, is known as "carry-over," and is also becoming known as "fly-wheel effect." Other labels would be "heat storage capacity" or "thermal inertia." By definition, it is the thermal inertia of the structure being considered so that once the building is heated, it cools very slowly, and vice versa. That is why cooling equipment selected on the basis of the instantaneous heat gain type of estimate results in highly erratic and unsatisfactory performance.

The heat stored in the mass of the structure, whether it be at high or low temperature, keeps room temperature above or below thermostat cut-in point for longer periods than are correct for proper operation. In a normally closed, cooled and occupied house, inside off-cycle temperature varies so slowly that infiltration air and re-evaporation of undrained coil condensate cause space humidity to rise very rapidly and often reaches an uncomfortable condition long before space temperature has risen sufficiently to start the cooling unit.

Reasons for this heat lag are not fully known since there is no accepted method of determining the temperature and moisture storage ability of the average frame, or frame and masonry veneer house. It is known, however, that the average home contains very few items which will absorb moisture to any appreciable degree. This is one of the reasons why the humidity rises so rapidly during the air conditioner off-cycle. Water vapor is in suspension in room air, and therefore, more noticeable, with greater reduction from comfort conditions.

For these reasons it is obvious that nearly constant operation of the air conditioner is to be preferred to maintain a comfortable relative humidity and an even temperature. For such operation, without overcooling the space, we must develop a method of unit size determination which will allow the use of the smallest unit practicable to maintain comfort conditions of both temperature and humidity.

Numerous studies have been made in this respect but there are no published table of formulas which will make such heat gain calculations and unit selections absolutely certain. Studies indicate that the cooling unit should be sized at some point between 50% and 85% of the instantaneous load estimate. Some of the reasons used to arrive at this conclusion are enumerated in the ten paragraphs as follows:

(1) Maximum exterior sun load in the continental United States occurs between 3 and 6 p.m. depending on North Latitude.

(2) Maximum heat transfer, outside to inside, occurs between 8 and 10 p.m.

(3) Air conditioned homes are normally kept closed throughout the 24-hour day and door openings are minimized.

(4) Internal sensible heat gain in a home is normally very light and should be treated lightly. Too much emphasis has, in the past, been placed on kitchen appliance loads, which are in use only about 1½ hours per day at average conditions. Duct systems should be so installed that a greater quantity of air may be delivered to the kitchen area when necessary. Load for occupants is about ⅔ that figured for the entire family.

(5) It is impractical and uneconomical to design residential cooling to maintain comfort conditions in the kitchen during periods of heavy loads such as when canning, preserving, or during preparation of large quantities of food for parties. Neglect kitchen appliance loads, except in unusual installations where a high rate of usage occurs. It is often less expensive and more satisfactory to provide an outdoor vent for laundry equipment than to include such loads in the heat gain estimate.

(6) The latent heat load consists chiefly of infiltration

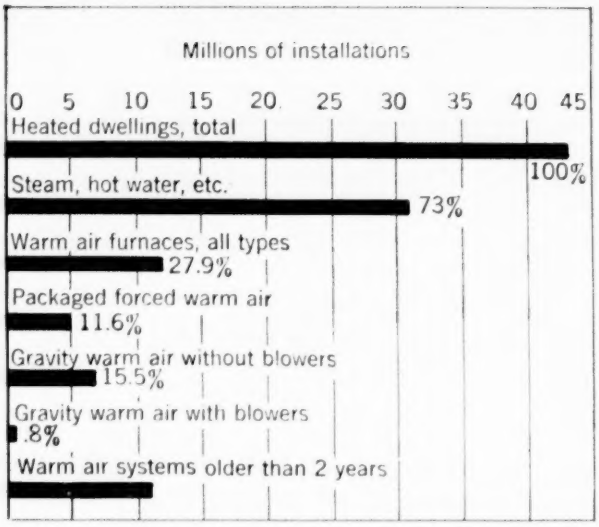



Fig. 2. Approximate numbers of heated homes in the United States in 1952 and percentages of types of systems installed.

air, and heat generated by people in a mildy active state. Other moisture gains, such as kitchen steam and bathing are slight enough to be ignored. This reasoning follows items 4 and 5.

(7) Some engineers recommend that no ventilation air be introduced, but if it is added, there should be only enough to maintain a slight positive pressure or to compensate for that amount of air discharged by constant running exhaust fans only. A kitchen exhaust fan which is operated for half an hour, now and then, would not be considered constant running. High volume exhaust fans are never recommended for use with residential air conditioning. To operate such a fan with residential air conditioning is to defeat the purpose of the air conditioning system unless an equal volume of outside air is simultaneously introduced. Such procedure is unwise and prohibitive pricewise in residential installations.

(8) The reasoning applied to kitchens should also be applied to living rooms during heavy occupancy and lighting loads such as at parties. The cost of equipment to maintain comfort conditions for 10 to 20 people for instance, would be excessive, and would nullify the extra precaution taken to select the most suitable equipment for average conditions. The best answer to this problem is to close discharge registers to unoccupied rooms during parties, or to provide additional supply air outlets for use only during heavy occupancy to force a greater quantity of air into the occupied spaces. Proper location of the control thermostat is an important factor in this type of operation. Furthermore, if the house is sufficiently pre-cooled, fly wheel effect will tend to maintain comfort conditions for a reasonably long period of time after full occupancy occurs. At night parties, heat transfer from the outside is greatly retarted or starts to decrease at about 10 p.m. and this permits the unit to maintain comfort conditions with a heavier than estimated normal occupancy load.

(9) One air change per hour for infiltration is quite sufficient for the average residential application. More air changes means larger equipment.

(10) It is unnecessary to attempt to control humidity to a fixed value. Experiments show that relative humidities usually average around 40% with properly sized equipment, which is satisfactory for comfort conditions, even though estimate calculations were based on 55% RH.

Considering these ten points, it is advisable to use smaller equipment for residential cooling than would be indicated by the instantaneous heat gain calculation method. But how much smaller?

Suppose an instantaneous heat gain estimate has been made of a house and the load determined on the basis of the sum of all the instantaneous loads. According to the ten points outlined, the cooling load estimate is much too high. A correction factor must be applied to compensate for the full time operation of the equipment to provide the temperature and humidity conditions required and to take advantage of the heat storage capacity of the house.

If another estimate is prepared by the 24-hour method, to obtain an average for the day, the load usually will be between 15 and 25% less than the instantaneous load. Some research engineers recommend that approximately 10% of the corrected net load figure be added to provide a reasonable safety margin for equipment selection. This has not been definitely established as necessary and the safety factor may be omitted, if desired, or if conditions warrant, it may be used.

In actual practice it has been found that for most residence the adjusted cooling load estimate should be approximately 20% less than the instantaneous gain. From this and the difference between the instantaneous and the 24-hour load calculations, we may reach a reasonable conclusion that the actual capacity requirements for a residential unit are about 80% of load calculations based on the instantaneous heat gain determination method. This matches closely the total heat gain as determined by the 24-hour method of heat gain estimate, which is a long and tedious procedure.

### Air Distribution

If ducts are properly sized and installed, no difficulty will be encountered in year-round conditioning, providing proper attention is also given to the cfm required in both summer and winter. A few engineers believe that the same quantity of air used in winter is sufficient for summer. Perhaps they are correct, but the writer has found it difficult to maintain a satisfactory year-round balance with a summer-winter system by using the heating air cfm for summer cooling. This is practical experience, not theory. On the other hand, it may be possible to heat with summer air requirements, and the best way to determine this, is by trial and error experiments until a satisfactory balance can be maintained throughout the year. In either case, the things to be avoided are discharge noise, cold drafts, stratification in summer and winter, and fan motor overload. It may be possible, by careful adjustment of the system and attention to fan motor load, to strike a happy medium between summer and winter air requirements.

We have always based our duct sizes on the quantity

of air required for cooling the home rather than on the Btu per hr per room basis and have never had difficulty with any installation.

Unfinished attics are ideal duct locations in homes without basements or crawl space. Duct layout and application is greatly simplified when the conditioner is installed in a first floor utility room and ducts are run up to and across the attic joists. These joists should never be panned in residential summer air conditioning unless lined with sheet metal and well insulated. Condensation inside unlined panned joists can ruin ceilings and walls.

Where a satisfactory balance between summer and winter air requirements cannot be obtained, the use of two fans, or a two-speed fan may be necessary in combination or twin unit installations so that the cfm of air can be varied according to the season. Using separate fans for cooling and heating also reduces the work involved in seasonal changeover, which must be accomplished as easily as possible if an installation is to be satisfactory servicewise.

The number of operations, or control changes, to be made by the owner must be minimized as much as possible. Excessive damper turning, switch pulling and mechanical change-over detail can become a detrimental factor in future sales of additional units. This is the age of automatic appliances and home owners not only expect automatic operation, but demand it.

The isolating damper between summer and winter units should be the only manual operation necessary to be performed by the owner. This may also be eliminated by installing a damper motor to be controlled by the thermostats.

If an air conditioner is to be installed into an existing duct system, the duct should be thoroughly checked for total static pressure. It may be necessary to increase the size of the motor, drive assembly, or fan, or all three.

Supply registers should be of the adjustable type with a volume damper attached, or they should be easily opened and closed so that rooms may be shut off in favor of other rooms with periodic heavier occupancy.

Determining room cfm is by no means the mysterious, unsolved problem which various sources would have you believe. If a single central return is used, determine room cfm percentage by dividing room cubic volume by total net cubic volume. Multiply the total cfm supplied by the conditioner, by the room percentage expressed as a decimal, to obtain room cfm.

The equation for this calculation is as follows:

$$\text{Room cfm} = \frac{\text{RV}}{\text{TNV}} \times \text{fan cfm}$$

Where RV = room volume
TNV = total net volume

Net cubic volume is the gross volume less the cubic volume of hallways, closets, utility room, or any space included in the gross cubic volume but not to be conditioned or which is to be used as a return plenum.

It is common practice to cool a space only if it is to be occupied, therefore the cooling of closets and other unoccupied spaces is a serious waste of air conditioning. Include heat gain for ceilings and walls as noted, but provide no direct air distribution to such spaces. This is the basis of the net cubic volume method of calculating room cfm requirements.

It is unnecessary to provide cold air outlets in hallways which are to be used as return plenums. Heating registers in such spaces may be closed for the summer and that quantity of air divided between other cooled spaces as described.

The quantity of air gained in east and north rooms by the omission of closets and hallways from the calculated cfm requirements may be supplied to west rooms by proper balance of supply registers.

If individual room returns are used, the cfm requirements per room may be determined by this same method except that hallways should also be calculated and cold air supplied to them. This is particularly true in one-story homes. First floor internal halls may be ignored in two-story homes.

Even though inside halls and closets are sometimes neglected in air distribution calculations, the floors and ceiling should be included in the heat gain estimate, depending upon their location in one- or two-story homes. Any outside walls of closets or halls should also be included in the load estimate.

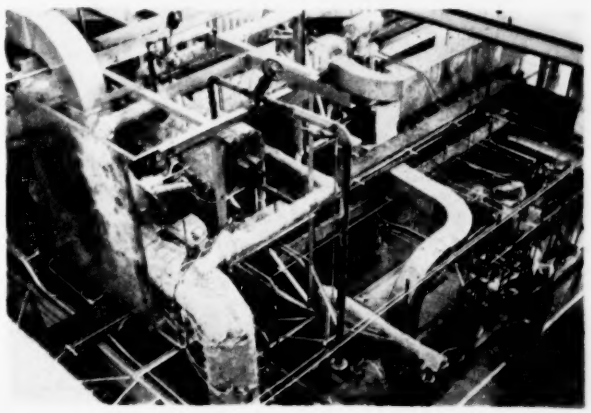
Air conditioners installed with warm air furnaces should be provided with facilities to bypass the cold air around the combustion section of the furnace. Likewise, hot air should be bypassed around the cooling section. The necessity for this may be determined by consulting local codes and from the American Gas Association codes for combination cooling and heating. This is especially applicable to duct type gas or oil-fired heaters.

## Atomic Power Installation

At the Knolls Atomic Power Laboratory in Schenectady, N. Y., operated for the Atomic Energy Commission by the General Electric Company, liquid sodium is pumped and metered electromagnetically. The closed circuit loop was devised to study electromagnetic pump and magnetic flowmeter operation and to obtain performance curves by computing pressure versus flow, using voltage, pressure and sodium temperature variants. Flow is measured by the magnetic flowmeter in gallons per minute with an accuracy within two per cent.

Temperatures vary according to tests performed and range from 580 to 1,000F.

The pump and flowmeter operate on magnetic principles and have no moving parts.



# Modulating and Load - Limiting Controls for Electric House Heating

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**The purpose of this article[1] is to discuss the kinds of controls currently in use, the operating characteristics of predominating types of electric heating installations, certain principles that govern the application of automatic controls, and some of the directions in which improvement can be looked for. In addition, attention is called to the substantial benefits obtainable through development of thermal storage materials and devices, toward which a start has already been made for application as supplementary heat source for electric heat pumps and for complete solar heating of buildings.**

AMONG the characteristics of electricity favorable to its use for the warming of dwellings are both the simplicity of application to a variety of heating-system types, and inherent adaptability to automatic control. However, the majority of installations in service today do not fully achieve the potential benefits obtainable through control of demand and refinement of regulating method.

Resistance-type heating systems installed in U. S. A. were estimated two years ago to represent about 100,000 dwelling units. Rate of growth since then appears to have been about 17% annually and for the current year the anticipated increase is a little less. On this basis there can be expected by end of 1955 at least one-quarter million installations. These will represent an aggregate connected load approaching two million kilowatts, exclusive of the heating installations which utilize electricity on the heat pump principle.

## Types of Electric Heating Systems

Electric resistance-type heaing equipment and complete heating systems are classified in four main categories.

(A) Radiators, convectors, unit heaters
(B) Panel-type installations
(C) Central hot-water systems
(D) Central warm-air systems

The first, and now the predominating, type of system uses electric resistors or heating elements assembled within a frame or casing designed for installation either recessed into the wall, ceiling or floor, or mounted upon these surfaces. The units deliver heat both by convection and by radiation, the ratio of components depending upon configuration, dimensions and location within the room, and on the operating surface temperature. The usual location is beneath windows or along the walls for baseboard types, as is the case with comparable steam or hot-water convectors.

[1]Based on a paper prepared for the American Power Conference.

Panel-type installations employ large heating surfaces operated at low temperature, usually below 120F, containing the electric resistors. These may be cables or wires embedded in plaster ceilings or cement floor slabs, becoming integral with the structure. Prefabricated panels resembling conventional plaster-board to be nailed or screwed in place may contain either filament conductors or sheets of conductive rubber. An alternative to such rigid panels is the use of flexible laminated sheets containing the filaments or rubber layer, arranged for applying like wall paper with special adhesive to conventional ceiling construction.

For central hot-water systems, standard radiator or convector units are used, with water circulation by thermo-syphon action or by motor-driven pump. A heat exchanger having electric immersion elements supplies the heat.

Central warm-air systems employ banks of resistors mounted in a frame or housing inserted directly into the duct system through which the air is circulated to and from the rooms by a motor-driven blower.

## Conventional Control Methods

For Type A systems, the manufacturers of convector or resistor units usually recommend provision of a thermostat in each room or on each unit, together with a manual switch to permit cutting off the room when unoccupied. Thermostats are commonly of bimetallic type using mercury contact device, or of low-voltage type actuating a relay. Spread between on-and-off positions is between 0.2 and 2F. Less common than this fully decentralized control is provision of a thermostat for a group of connecting rooms or for the entire house, with or without features for night set-back of room temperature.

In the case of Type B systems the thermostat arrangement is generally the same as described. However, owing to time lag in the response to thermostat signal, as result of thermal storage of heavy ceiling panels or floor slabs, or of the entire structure, a heat-anticipating type of thermostat is desirable; an alternative is to use a supplementary outdoor thermostatic element responding to rate-of-rise for air temperature and combined with solar radiation effect. Either of these devices tends to prevent over-shoot of indoor temperature and sluggish response to demand for heat.

For Type C systems, immersion elements within the heat exchanger are controlled by a temperature-limiting thermostat at the exchanger. Water-holding capacity of the system should be made sufficient to minimize frequency of cycling. For safety, the resistors may be interlocked with the circuit of the water circulating pump.

so that they can be energized only when pump is in operation under control of the room thermostat.

For Type D systems, using a bank of resistors centrally placed with reference to the air-distribution duct system, it is customary and desirable to divide the resistors into groups so connected to the thermostatic control that the electric input varies in inverse relation to room temperature—thus obtaining a form of modulation. Damper regulation by throttling or bypass methods, as used with steam or hot-water coils in warm air heating practice cannot be used with electric heat, since temperature of the resistors will vary as is necessary to compel the air to accept the heat produced by the fixed electric input, irrespective of airflow rate or inlet temperature.

With any of the above control arrangements, especially those for centralized heating systems, a time-delay feature is desirable, in order that whenever a thermostat calls for heat, the individual circuits or units will come on non-simultaneously through an appreciable time interval—to reduce voltage flicker effects. This provision is also advisable to enable restoration of service after an emergency service interruption. Some resistor units, such as certain varieties of glass panels with fused-on conductive coatings, have power input when cold up to 1.5 or 1.6 times the rating for normal operating temperature; thus a 10-kw heating installation for 240-v service might take 65 amp at "cold start" for a time interval measured in minutes—not seconds, as with across-the-line motor starting. This starting-current value is based on unity power factor, which may or may not be realized since it is governed by configuration of the conductors, design of heating elements and other factors.

### Modulating and Load-Limiting Controls

Less conventional than the simple arrangements outlined are several devices now commercially available which give both load-limiting and modulating control. They are applicable to any of the four general types of heating installations on single-phase 240-120 volt 3-wire service. By means of double-throw transfer switch, power actuated, the resistor heating units in groups are connected either to 240 volts or to 120 volts with balance maintained between the live conductors and the grounded neutral. This cuts the load and energy consumption by 75% and the heating capacity to one-quarter, or increases it in inverse relation. The control is actuated by a relay connected to indicate the demand or input of circuits for either: (a) load exclusive of heating system, i e embracing lights, miscellaneous appliances, cooking range, water heater; (b) total load including the heating installation; (c) heating load only.

Provision is made also for connecting an outdoor thermostat so that in moderate weather the heating system remains on 120 volts, thereby obtaining modulation in a simple form. Depending on climate, type of structure and preference of the occupants, this thermostat may be set usually between 55F and 60F. Another optional feature is night set-back to half voltage by manual throwover switch or a separate night thermostat.

The Electromode "automatic demand control" for 240-120 3-wire service operates to limit demand by switching resistor units over to reduced voltage when combined heating and domestic load, i e, the customer's total load, reaches a predetermined demand setting. For example, if 10 kw is the predetermined demand setting and there are heaters aggregating 12 kw, the assured capacity available for uses more essential than heating becomes 7 kw.

The control is responsive to the sum of currents in both "hot" wires of the 3-wire service and operation is therefore independent of load balance. Range of adjustment is 6 to kw. If set for 10 kw, and a load of that magnitude is reached, the transfer switch then reduces the heating voltage and load. At the end of approximately 4.5 minutes the unit automatically recycles, restoring the heaters to normal voltage. If total load then still exceeds the 10 kw setting, the unit repeats the cycling and so continues as long as load exceeds setting. In an alternate arrangement the control is dependent on heater load only, not total load. When desired, an outdoor thermostat can be used, so that either outside temperature or space heating load causes voltage reduction, with the load-sensing relay always taking precedence over the thermostat.

The Wesix "automatic load regulator" has a current relay of the ammeter type which measures the load from range, water heater, lighting and appliances. At a set position of the moving element a contact closes, causing a miniature 30-watt motor to rotate an eccentric arm through 180-degree stroke, thereby actuating the main switch contacts. There are no solenoids and in other respects the device is designed for quiet operation.

The main switch consists of two single-pole double-throw contact arms with a capacity of 50 amperes each. The secondary contacts are connected to neutral. Thus, the switching mechanism disconnects the heaters from 240-volt supply and connects them to 120 volts whenever the remaining load exceeds a preset value. Single-pole switches are used, one for each of two circuits, to keep the load approximately balanced.

Connected in series with the control circuit of this device are terminals for adding a double-throw thermostat located outdoors. With outdoor temperature falling below about 58F, the "on" contacts are closed and the control circuit to the current relay is completed. A rise in temperature outdoors causes the thermostat to close the "off" contacts, thereby energizing the switching motor to close the main secondary contacts, reducing the heater capacity to one-fourth.

By adding still another double-throw thermostat to the control circuit of the regulator, a central night temperature control is provided to maintain a house temperature below normal but above 55 to 60F. This thermostat is connected through a double-throw selector switch which may be clock operated or manual as preferred, and which selects either the outdoor thermostat or the central night thermostat. This selector is mechanically connected in parallel with a double-pole 30-amp single-throw switch to open the neutral connection to the secondary contacts, making this an off position during the night period. Thus, the night thermostat controls the heating system between high and off positions and maintains a reduced temperature level.

At any time, night or day, should the range and lighting load increase unduly, the load regulator will reduce the heating load irrespective of the position of the outdoor or night thermostat. Likewise, should anyone disconnect or short circuit the control wires leading to these

auxiliary thermostats, the regulator will move to the secondary contacts. In summary, by sealing the load regulator the customer is prevented from intentionally defeating its purpose.

### Automatic Control Systems

Advances in control methods and devices coincident with the remarkable development of electronic apparatus through the past decade, have yielded better sensitivity and stability, closer response to fluctuating load conditions, greater simplicity of calibration and initial adjustment, and lessened maintenance—along with falling prices and rising quality. For electric resistance-type house heating installations, it is reasonable to expect much further refinement of control apparatus and techniques, with specific attention toward improvement of electric load characteristics—once the manufacturers become informed as to magnitude of the potential market, and receive sufficient information on desired performance characteristics as specified by users, consultants and the electric utilities themselves.

The outstanding advances in automatic control technique have come about through recognition and application of the so-called "feed-back" principle of regulation. This embodies four essential functions:

(1) Measurement of the desired condition
(2) Comparison with a standard
(3) Application of correction
(4) Check of condition after correction

By making the increments of correction or the frequency of application progressively smaller, in a stable system, any desired degree of accuracy can be attained. With manual control, functions (2) (3) (4) are performed by a human operator who then supplies the feed-back link. Principles underlying feed-back control are outlined below.

Automatic control systems in general may be classified under two broad types:

(a) Open sequence, in which one or more independently variable factors or quantities act to regulate the controlled variable or result
(b) Closed system, in which the controlled result is itself reflected back and becomes a component among the regulating factors

The principle basic to the closed loop (b) is fundamental for all self-regulating systems and constitutes "feed-back".

An example of the open system (a) is found in the hypothetical use of an outdoor thermostat to regulate power input to an electric house-heating installation. As outdoor temperature falls, the voltage applied to terminals of the resistors is increased, or the number of resistors placed in operation increases. The system requires calibration for specific conditions of each installation; if desired, several sets of conditions may be applied selectively.

The essential features of the open-sequence system, as described for house heating, is that the indoor temperature produced has no effect on action of the control—nor does it serve as a correcting factor. Consequently, changes in amount of sunshine or wind, or the internal heat contributed by the electric lighting system and miscellaneous appliances will react immediately and disturb the indoor temperature.

The closed system or feed-back (b) overcomes such difficulties. It brings directly into effect the quantity to be controlled and thus creates independence from any and all kinds of disturbances. Moreover, it does not require calibration for each special condition or combination. Feed-back control, unlike open sequence control, must nevertheless always involve some error, since it is error which brings about the correction. However, magnitude of error can usually be made quite small without undue complication nor excessively delicate mechanism.

An example of closed-sequence control or feed-back is obtained merely by changing location of the thermostat previously mentioned, from outdoors to indoors—the conventional arrangement. So long as the thermostat is unsatisfied, electric power is supplied to the resistors; the resulting rise of indoor temperature affects the thermostat and it cuts off the power when the temperature becomes too high. Modulation is obtainable by varying the amount of electric power supplied, in some proportion to the degree of error existing.

A limitation common to many feed-back controls is tendency toward over-correction or "self-excitation", which produces oscillation often called "hunting". The degree of success in application of these controls depends very largely on finding simple measures to prevent oscillation. Consequently, the three general types of oscillation will be briefly described.

If the input quantities oscillate in value, then the output value also will oscillate, not simultaneously nor necessarily in the same way, but with the same frequency. Usually in mechanical systems output oscillation lags behind the input. For example, if power input to a heating system fluctuates slowly up and down, the indoor temperature will likewise rise and fall the same number of times per minute, but the maximum temperature during each cycle comes later than the maximum application of heat, because of inherent time lag. The lag, considered as a fraction of one oscillation, usually increases with frequency—the faster the input is varied, the farther behind the output falls.

When a feed-back system involves within its closed loop some quantity which oscillates, this causes the successive quantities around the loop to oscillate also. When the feed-back is equal and opposed to its error, the oscillation continues indefinitely. However, when feed-back of the system is less than and opposed to the error, disturbances in the system tend to be dampened and to disappear. Finally, with feed-back of system greater than and opposed to the error, disturbance within the system tends to be amplified and conditions get out of control.

Magnitude of feed-back that should be provided is of critical importance in the design of control systems. On the one hand, to obtain accurate control the feed-back must be made adequate. On the other hand, such an increase may accentuate any small oscillation, and the increasing oscillation renders the control useless.

Several measures may be used to secure stable control. First, the time-lag may be minimized by using electronic tubes or other varieties of quick-response power sources. Secondly, special elements can be introduced to obtain a time-lead, anticipating the time-lag. Such devices are

called phase-advancers and often have the properties of electric capacitors. Thirdly, it is possible to introduce other feed-backs besides the main one, so designed as to reduce time-lag. Modern achievements in automatic control are based on the use of combinations of such devices to obtain both accuracy and stability.

### Factors Affecting Control of Electric Heating

In the choice of control principles and devices there are certain self-regulating factors inherent with all house-heating applications, of which due account should be taken, such as:

Thermal storage or "flywheel" effect inherent in buildings, i e, heat released by structural materials and contents, tending to retard the fall of indoor temperature when voltage is reduced or power is cut off

Heat contribution obtained from the concurrent electric consumption for lighting and miscellaneous appliances at times when total load of the residence is high

Benefit obtainable from adequate thermal insulation of the structure, in the reduction of both amplitude and time-rate of indoor temperature fluctuation

Infrequent occurrence and limited duration of extreme low temperatures, seasonally and daily

Reduction of power input to resistors, caused by distribution-system voltage regulation and line drop which accompany peak demand

Since electric heating is more susceptible to conditions of fluctuating load and carries higher price on purchased-heat-equivalent basis, than for fuel-fired systems, refinement of control systems to take account of the factors named is fully warranted.

### Development of Control Apparatus

In addition to simple voltage reduction already mentioned, by transfer of resistor units between 240 and 120 volts on 3-wire service, there are other methods applicable to achieve improvements in accuracy and uniformity of temperature control, in economy of electric energy consumption, and in reduction of peak demand. These include, for example:

Use of auto-transformers to provide voltage at terminals continuously variable over a substantial range

Circuit arrangement for series-parallel switching of resistors

Programming device to shift the power supply from one room to another in a predetermined sequence, with or without bias of the timing schedule by means of an outdoor thermostat and/or by total electric load

Load regulation by carrier current from a central point or substation located on the electric distribution system

Some of these have been constructed experimentally or given limited field trial. They can be devised to provide modulating characteristics whereby heat delivered to the dwelling is regulated in conformity with the day-to-day and the diurnal variation of outdoor temperature and of sunshine.

The greater cost of such improved control equipment should not become a serious deterrent, considering the potential savings through reduction of peak electric demand and the benefits from better control of indoor temperature. Economies can be looked for with modern fabrication methods such as the new "printed circuitry" in the electronic industry and mass production of devices such as auto-transformers. For example, a large apparatus manufacturer has indicated that a 7.5 kva auto-transformer for 240-186 volts to provide 60% of normal heating capacity in addition to the 25% obtainable with line-to-neutral transfer would be less than $50; variable-ratio features would add somewhat to the cost.

### Off-Peak Domestic Water Heating

The practice of heating water electrically during off-peak hours, which originated many years ago, is now regarded by some utility companies as highly important in furnishing economical service to residential customers. Such off-peak operation is not contingent upon use of electricity for cooking. Other companies consider that for their conditions, off-peak water heating has little if any advantage, compared with its disadvantages. For electric house heating the same variability of conditions and viewpoints may apply. Experience with such types of controls is nevertheless available for investigating the possibilities, alone or in combination with other load-limiting procedures.

Because of equipment costs and the expense for supervision and maintenance, it may be difficult to justify these systems unless there is a large concentration of electric house-heating installations. The plan however appears to have possibilities, particularly where water heating is already subject to off-peak control.

### Characteristics of House-Heating Load

Many analyses of house-heating load have been turned out by individual utility companies and by committees within the industry, to provide a basis either for establishing policy with respect to any contemplated local house-heating promotion, or for adjusting rate levels or types appropriate to the load. The results have often been inconclusive, or inconsistent with findings elsewhere.

To supply the lack of comprehensive and authentic data, a set of recommendations covering the assembly and analysis of house-heating data has recently been drafted by a utility-industry committee concerned with research into load characteristics and rate applications.

General conclusions derived from a survey of existing data on electric resistance-type house heating practices and performance are summarized as follows:

Heating by electricity should be confined to houses adequately insulated, with double windows or at least weather stripping.

Seasonal energy consumption for such dwellings, expressed as "heat factors", i e, kilowatthours per degree-day per 1,000 cu ft gross volume, seem to be between 0.3 and 0.4; however, these values probably ignore "economy" practices employed frequently for avoiding excessive cost.

Heat factors above 0.4 usually result from incomplete insulation, or from severe exposure, or from abnormal living habits.

Heat factors appreciably less than 0.25 have often been found to result from "incidental" living, or from full utilization of only part of the available space, or from other unusual conditions.

There is a definite tendency to size the heating installations at or below the design requirements, as compared with past practice in the case of fuel-using systems, for which excess "reserve" capacity margins up to 30 or even 40% have arbitrarily been added to assure rapid heating, quick recovery and adequacy for extreme weather.

### Heating Capacity Requirement

Concerning comparative costs of the competitive forms of heat available for house heating, two comparisons may be cited. On per-Btu-utilized basis, electricity at $0.02 per kwh is 3 to 4 times as expensive as oil at $0.14 per gallon, and it has 6 to 8 times the cost of natural gas at $0.50 per Mcf. The disparity is overcome mainly through evaluation of indirect and intangible benefits derived with electric heating, and not infrequently by a favorable difference in investment cost for the owner's heating installation.

The direct, obvious and economic method of "load-limiting control"—necessary with electric heating—is to hold the installed capacity at the minimum amount capable of giving satisfactory heating service, in two ways:

(a) Provision of adequate thermal insulation and "tight" construction

(b) Avoidance of surplus capacity in heating units, i e, connected load

Because electricity is more expensive than fuel-generated heat, its use justifies greater outlay for insulation, double glazing, weather stripping and careful workmanship. One company not only stipulates minimum insulation standards, but also calls for a load-limiting type of automatic control. Moreover, incentive toward compliance is provided by waiving the monthly demand charge in rate schedule that ordinarily would apply to house-heating load.

Electric heating capacity to be installed is predicated on heat loss calculation for which equipment manufacturers' application-engineering literature generally recommends the ASHVE Guide method. The chapter on Heating Load gives procedure for calculating instantaneous rate of heat loss from buildings, i e, steady-state conditions, but it does not stipulate precisely how to establish three important items:

(a) Outdoor and indoor temperature, and hence temperature difference, for design

(b) Effect of thermal lag in relation to normal 24-hour temperature variation and abnormal rapid fluctuation

(c) Amount of "safety margin" to be added for conservative design, including so-called "rapid pick-up" extremes of weather, possible sub-standard performance of heating apparatus, etc.

These in the aggregate can have large effect, and may prove highly detrimental with electric heating. For example, a bulletin issued by REA as recently as November 1952 uses the lower of the two alternate bases for outdoor temperature and contains the recommendation: "An additional 30% of heating capacity should be installed as a reserve." Combining the two items, which represent extreme conservatism, for the case cited in bulletin the heating capacity excess becomes, as above:

(a) Temperature difference (70-0)/(70-14) = 1.25 factor

(c) Safety margin 1.30 factor

Combined excess $1.25 \times 1.30 = 1.62$

Thus the recommendation would result in 62% excess capacity, with consequent high installation cost, needless monthly demand charge, impaired temperature regulation, and undue high peak-hour demand on the utility system. For properly constructed houses and heating systems, thermal lag alone is being found sufficient to provide requisite margin. The economics of electric house heating in the long run cannot tolerate injudicious large capacity margins.

Basis for outdoor design temperature determination is currently receiving attention from two of the ASHVE Technical Advisory Committees. In Canada, a Weather Atlas to be published about middle of 1953 by National Research Council will contain outdoor design temperatures on four bases, namely, 99, 97.5, 95 and 90% respectively. These will enable consultants and owners to exercise wider latitude of judgment in recognizing economic as well as performance factors. Similar practice in the United States appears desirable; it is possible that for electric heating the 95% basis would ultimately find wide aplication—as a justified means of promoting load-limiting control.

### Thermal Storage

In principal, thermal storage has sound and important possibilities for reducing peak electric demand to handle short-time extreme weather conditions and the normal variations in daily weather cycle. Experiments have been conducted for half a century, using many substances including rock, metals, natural soil, water and other liquids. A substantial number of installations with water have been built, some utilizing temperature upwards of 250F and suitable pressure; however, cost and space requirement have been high.

At the present time a different approach is under investigation in projects concerned with electric heat-pump systems and solar heating. Substances having considerable latent heat of crystallization, with melting and solidification occurring within the temperature range useful for house heating are being developed by chemical manufacturers and research laboratories. An example is di-sodium phosphate which crystallizes in one of its forms with twelve molecules of water. Considerable literature on the principles of crystallization control and on the performance of experimental apparatus is available for reference. While an economic design is not yet definitely in sight, the results have been encouraging and research is being accelerated.

## Air Conditioning, Refrigeration, and Heating and Ventilating

# Courses Offered by Colleges

NATHAN N. WOLPERT

Associate Editor, Heating and Ventilating

**A tabulation of courses in air conditioning, refrigeration, heating and ventilating, given by engineering colleges and institutes as part of the requirements for a degree or graduate study.**

A STUDY was undertaken to assemble information on the courses that are given at the universities, engineering schools and institutes in the United States, in the fields of air conditioning, refrigeration, heating and ventilating. It follows a survey that was undertaken in 1949, the results of which were published in the March and April, 1949 issues of HEATING AND VENTILATING.

While it is possible that some colleges offering this group of courses were omitted, every effort was made to make the study all inclusive. After checking lists of colleges and universities from several sources, letters were sent to the university or college. If the first letter failed to bring the necessary information, a second letter was sent, and if this was not successful, that college was omitted from the list.

Where courses are given in the four fields mentioned, they are generally given in the senior year, either as an elective or as part of the heating and ventilating option. In some cases, such studies are reserved for graduate students.

Colleges located in large cities, such as Chicago, New York and Pittsburgh, and in the center of considerable engineering activity, generally provide evening courses.

A four-year course in Air Conditioning and Refrigeration Engineering that leads to a B.S. degree is given at California State Polytechnic College, San Luis Obispo, Calif.

In 1949, North Carolina State College of Agriculture and Engineering, Raleigh, N. C., started a four-year curriculum in heating and air conditioning leading towards a B.S. degree in Heating and Air Conditioning. In 1952, the first class graduating under this program consisted of five students. At present there are 53 students enrolled as candidates for this degree. Although specific courses in heating and air conditioning theory, design and laboratory are taken in the senior year, a carefully planned series of technical courses have been provided prior to that as good engineering background. The program includes, in addition, a series of courses in the humanities.

The curriculum was established with the aid of the North Carolina Association of Plumbing and Heating Contractors and this group has endowed the L. L. Vaughan Professorship of Mechanical Engineering at the college.

At the University of Wisconsin, Madison, Wis., in the group of Heat Power elective in the senior year are courses in air conditioning, refrigeration, industrial heat transfer and flow of compressible fluids. Courses by correspondence are given in both heating and ventilating and in refrigeration. In addition a graduate program under direction of the Engineering College is given in Milwaukee, with members of the faculty traveling to Milwaukee to conduct evening classes.

There is a type of instruction that falls between the engineering college level which offers degrees, and the vocational school which trains students in specialized mechanical dexterities. It is the training provided by the junior college or even the college offering engineering degrees. This curriculum which is planned for several years study, provides a certificate at the completion of the courses although the courses themselves are on college level.

Included in this group are the Newark College of Engineering, Newark, N. J., which has a three-year evening certificate program in Refrigeration and Air Conditioning; Franklin Technical Institute, Boston, Mass., which has a three-year certificate course in the evening in Heating, Ventilating and Air Conditioning—a design course on professional level; Wentworth Institute, Boston, Mass., as part of its two-year day course in Steam and Diesel Engineering, has a course in refrigeration; the Milwaukee School of Engineering, Milwaukee, Wis., has a two-year program termed the Air Conditioning Technician Curriculum and this plus an additional two years of study at the school, leads to a B.S. in Mechanical Engineering degree; Pratt Institute, Brooklyn, N. Y., offers a four-year certificate course in air conditioning with the first two years devoted to both basic mathematics and physics.

School years are divided into semesters (the first term starting in September and the second in February) or are on the quarter basis with terms called Fall, Winter and Spring. A *Q* after a number under the head Term Offered indicates first, second or third quarter which corresponds to Fall, Winter or Spring terms. Where the school year is divided into quarters, and there is no *Q* following the figure under the head Credit Hours, then the credit hours are for the entire course; where the figure is followed by *Q*, then the credit hours are for the quarter. A single credit may be taken to represent one hour of lecture per week plus a prescribed amount of outside preparation, or it may represent an equivalent amount of laboratory work. In a few cases laboratory and lecture courses are combined.

Requests for additional information about specific courses should be addressed to the college at the address listed.

**ENGINEERING COURSES AVAILABLE IN AIR CONDITIONING, REFRIGERATION, HEATING AND VENTILATING**

| Location | School | Course | Term Offered | Credit Hours | Prerequisites | Comments |
|---|---|---|---|---|---|---|
| ALABAMA | | | | | | |
| Auburn | Alabama Polytechnic Institute | Refrigeration | 1Q | 5 | Thermodynamics | Junior requirement |
| | | Air Conditioning | | 5Q | Refrig.; Heating and Vent. | Senior elective |
| | | Heat. and Ventilation | | 5Q | Thermodynamics | Senior requirement |
| University | University of Alabama | Refrigeration | | 2 | Thermodynamics | Elective |
| | | Heat., Vent., and A.C. | 2 | 4 | Mechanical Lab. | Required |
| ARIZONA | | | | | | |
| Tucson | University of Arizona | Air Conditioning | 2 | 3 | Thermodynamics | Elective |
| | | Refrigeration | 1 | 3 | Thermodynamics | |
| | | Heat Transfer | 2 | 3 | Thermodynamics | |
| | | Advanced Thermo. | 1 | 3 | Thermodynamics | |
| CALIFORNIA | | | | | | |
| Los Angeles | University of Southern California | Reversed Thermo. Cycles and Refrig. | 1 | 3 | Thermodynamics | |
| | | Industrial A.C. | 2 | 3 | Thermodynamics | |
| | | Refrigeration and A.C. | 1 | 3 | Thermodynamics | |
| | | Refrigeration | | | | 15-session extension courses |
| | | Air Conditioning | | | | |
| Pasadena | Calif. Inst. of Technology | Refrig. and A.C. | 1-2 | 9 | Heat Power | Sixth year |
| San Luis Obispo | California State Polytechnic College | Heat. and Ventilating | 1-2Q | 3Q | Physics | 2nd year requirement |
| | | Heat. and Vent. Prac. | 2-3Q | 2Q | | 2nd year requirement |
| | | Refrig. Eng. Practice | 2-3Q | 2Q | | 3rd year requirement |
| | | Thermo. of Refrig. | 1Q | 3 | | 3rd year requirement |
| | | Refrigeration Eng. | 2-3Q | 3Q | Thermo. of Refrig. | 3rd year requirement |
| | | Heat. and Vent. Prac. | 1Q | 2 | Heating and Vent. | 3rd year requirement |
| | | Refrigeration Lab. | 2-3Q | 2Q | Refrigeration | 3rd year requirement |
| | | Heat. and Vent. Lab. | 1Q | 2 | Chemistry | 3rd year requirement |
| | | Thermo. of A.C. | 1Q | 3 | H and V, Refrig. | 4th year requirement |
| | | A.C. Engineering | 2-3Q | 3Q | A.C. Thermo. | 4th year requirement |
| | | A.C. Eng. Practice | 1-3Q | 2Q | | 4th year requirement |
| | | A.C. Tests and Meas. | 1-2Q | 2Q | H and V, Refrig. | 4th year requirement |

| Location | School | Course | Term Offered | Credit Hours | Prerequisites | Comments |
|---|---|---|---|---|---|---|
| COLORADO | | | | | | |
| Boulder | University of Colorado | Heat Transfer | | 3 | Thermodynamics | M.E. required |
| | | Air Conditioning | | 3 | Heat Transfer | Senior elective |
| | | A.C. Design | | 3 | Air Conditioning | Senior elective |
| | | Refrigeration | | 3 | Thermodynamics | Senior elective |
| | | Advanced A.C. | | 3 | | Graduate |
| | | Adv. Heat Transfer | | 6 | | Graduate |
| CONNECTICUT | | | | | | |
| Storrs | University of Connecticut | A.C. and Refrig. | 2 | 3 | Thermodynamics | |
| | | Advanced A.C. and Refrigeration | 1 or 2 | | Undergrad. A.C. and Refrig. | |
| DELAWARE | | | | | | |
| Newark | Univ. of Del. | Heating and Vent. | | 3 | Thermodynamics | Required |
| DISTRICT OF COLUMBIA | | | | | | |
| | Howard University | Heat., Vent., and A.C. | 2 | 3 | Thermodynamics | Senior year |
| | | Mechanical Equip. of Buildings | 2 | 3 | Physics | For non mech. engineers |
| | The Catholic Univ. of America | Mech. Equip. of Buildings | 1 | 3 | Thermodynamics<br>Mech. Equip. of Buildings | Senior requirement<br>Senior requirement |
| | | A.C. and Refrigeration | 2 | 2 | Thermodynamics | |
| | The George Washington Univ. | Heating, Vent., A.C. and Refrigeration | 1-2 | 4 | | Senior requirement. Also given as evening course |
| FLORIDA | | | | | | |
| Gainesville | University of Florida | Refrig. and A.C. | 1-2 | 3 | Thermodynamics | Senior elective |
| | | Mech. Lab. | 1-2 | 1 | Refrig. and A.C. | Senior elective |
| | | Advanced A.C. | | 3 | Refrig. and A.C. | Graduate |
| | | Advanced Refrig. | | 3 | Refrig. and A.C. | Graduate |
| GEORGIA | | | | | | |
| Atlanta | Georgia Inst. of Technology | Heating, Vent., A.C. and Refrigeration | | | | Evening technical institute course |
| | | A.C. and Refrigeration | | 2 | Mech. Equipment of Buildings | Arch. students |
| | | Design of Mech. Equip. of Bldgs. | | 2 | A.C. and Refrig. | Arch. students |
| | | Heat., Vent., and A.C. | | 3 | Thermodynamics | |
| | | Refrigeration | | 3 | Thermodynamics | Senior elective |
| IDAHO | | | | | | |
| Moscow | Univ. of Idaho | Heat., Vent., A.C. and Refrigeration | | 3 | Thermodynamics | |
| ILLINOIS | | | | | | |
| Chicago | Ill. Institute of Technology | A.C. Analysis | 2 | 4 | Thermodynamics | Evening |
| | | Fundamentals of Heat. and A.C. | 1-2 | | | Evening |
| | | Heating and A.C. | 1-2 | 3 | Thermodynamics | Day and evening |
| | | Refrigeration | | 3 | Thermodynamics | Senior elective |
| | | Advanced A.C. | 1 | 4 | Thermodynamics | Graduate |
| Evanston | Northwestern University | Heating and A.C. | 1-2Q | 3 | Thermodynamics | } M.E. and Indust. |
| | | Advanced Refrig. | 3Q | 4 | Thermodynamics | { seniors |
| | | Advanced Refrig. | 3Q | 3 | Thermodynamics | Graduate—evening |
| Peoria | Bradley University | Heat., Vent., and A.C. | 1 | 3 | Thermodynamics | Senior requirement |
| Urbana | University of Illinois | Heating and A.C. | 1-2 | 4 | Junior standing | Required arch. |
| | | Heat., Vent., and A.C. | 1-2 | 4 | Heat Power Lab. | M.E. seniors |
| | | Heat., Vent., and A.C. Design | 2 | 3 | Previous course | Senior option |
| | | Refrigeration | 1-2 | 3 | Thermodynamics | Senior option |
| | | Heating and A.C. | 1 | 1 | } Heat., Vent. | Graduate |
| | | Lab Investigations in Heat. and A.C. | 1-2 | | } and A.C. | Graduate |
| | | Refrigeration | 2 | 1 | Undergrad. Refrig. | Graduate |
| | | Refrigeration Lab. | 1-2 | | | Graduate |
| | | Heat. and A.C. Design | 2 | 1 | | Graduate |
| INDIANA | | | | | | |
| Angola | Tri-State College | Heating and A.C. | | 5Q | Thermodynamics | M.E. required |
| | | Refrigeration | | 2¼Q | Thermodynamics | M.E. required |
| Fort Wayne | Indiana Technical College | Refrigeration | | 5 | Thermodynamics | Elective |
| | | Heating and A.C. I | | 5 | | Elective |
| | | Heating and A.C. II | | 5 | Heat. and Vent. I | Elective |
| Lafayette | Purdue University | Heat., Vent., and A.C. | 1 | 3 | Thermodynamics | Senior elective |
| | | Commercial Heating, Vent. and A.C. | 2 | 3 | Heat., Vent. and A.C. | Senior elective |
| | | Heating, Ventilating and A.C. Design | 2 | 3 | Heat., Vent. and A.C. | Senior elective |
| | | Refrigeration | 1-2 | 6 | Thermodynamics | Senior elective |
| | | Refrigeration and A.C. | | 3 | Heat Transfer; Thermodynamics | Graduate course |
| | | Refrigeration and A.C. Seminar | | 2-6 | Refrig. and A.C. | Graduate course |

| Location | School | Course | Term Offered | Credit Hours | Prerequisites | Comments |
|---|---|---|---|---|---|---|
| INDIANA (continued) | | | | | | |
| Notre Dame | University of Notre Dame | Refrigeration and A.C. | 2 | 3 | Thermodynamics | |
| | | A.C. for Architects | 2 | 3 | Thermodynamics | |
| Terre Haute | Rose Polytechnic Institute | Thermodynamics I | 1 | 3 | | Includes air and water vapor mixtures |
| | | Thermodynamics II | 2 | 3 | | Includes refrigeration |
| | | Air Conditioning | | 3 | | |
| IOWA | | | | | | |
| Iowa City | State University of Iowa | Refrigeration | | 3 | | Senior elective |
| | | Heating and A.C. | | 3 | | Senior elective |
| | | Combustion | | 3 | | Senior elective |
| KANSAS | | | | | | |
| Lawrence | University of Kansas | Air Conditioning | | 3 | Thermodynamics | |
| | | Refrigeration | | 3 | Thermodynamics | |
| | | A.C. Laboratory | | 2 | Heat Power Lab.; A.C. | |
| | | Refrig. Laboratory | | 1 | Heat Power Lab.; Refrigeration | |
| | | A.C. Design | | 3 | Air Conditioning | |
| Manhattan | Kansas State College | Air Conditioning | 2 | 3 | Genl. or Engineering Physics | Elective for students without Thermo. |
| | | Refrigeration | 1 | 2 | Thermodynamics | Elective |
| | | Air Conditioning | 1 and 2 | 3 | Thermodynamics | } Grad. and under-graduate elective |
| | | Advanced A.C. | 1 | 2 | Air Conditioning | |
| KENTUCKY | | | | | | |
| Lexington | University of Kentucky | Elem. Heating, Ventilating and A.C. | 1 | 3 | El. Physics | Service course for non-majors |
| | | A.C., Heat. and Vent. | 1 | 3 | Thermodynamics | Senior majors |
| | | A.C., Heat. and Vent. Design | 2 | 3 | A.C., Heat. and Vent. | Senior majors |
| | | Mech. and Elect. Equip for Bldgs. | 1 and 2 | 3 | Physics | For arch. majors |
| | | Refrigeration | 1 | 3 | Thermodynamics | Senior majors |
| | | Adv. A.C. and Refrig. | 1 | 3 | A.C. and Refrig. | Graduate course |
| | | Adv. A.C., Panel Heat. and Cooling | 2 | 3 | A.C. and Refrig. | Graduate course |
| | | Advanced Problems in A.C. and Refrig. | 2 | 3-6 | Advanced A.C. and Refrig. | Graduate course |
| Louisville | University of Louisville | Refrigeration | 4Q | 3 | Therm.; Heat Trans. | 5th year requirement |
| | | Heat., Vent., and A.C. | 3Q | 5 | Therm.; Heat Trans. | 5th year requirement |
| LOUISIANA | | | | | | |
| New Orleans | Tulane University | Refrigeration and A.C. | 2 | 3 | Thermodynamics | Senior requirement |
| Ruston | Louisiana Polytechnic Institute | Refrigeration | 2 | 3 | } Heat. Eng. and Thermodynamics | Senior requirement |
| | | Heat., Vent., and A.C. | 1 | 3 | | Senior requirement |
| MAINE | | | | | | |
| Orono | Univ. of Maine | Heating and A.C. | 1-2 | 3 | Thermodynamics | |
| MASSACHUSETTS | | | | | | |
| Boston | Northeastern University | Refrigeration | | 3 | Thermo. and Power Plant Equip. | Junior year |
| | | Heat., Vent., and A.C. | | 3 | Thermodynamics | Junior year |
| Cambridge | Massachusetts Institute of Technology | Air Conditioning | 1 | 3 | Heat Engineering | 4-year option |
| | | Advanced A.C. | 1 | 3 | Air Conditioning | Graduate elective |
| | | Heating and Vent. | 1 | 2 | Air Conditioning | } 3rd year arch. |
| | | | 2 | 2 | 1st term H and V | |
| | | Refrigeration | 2 | 3 | Heat Engineering | Graduate elective |
| | | Refrig. Applications | 2 | 2 | Heat Engineering | 4th year elective |
| | | Low Temp. Refrig. | 1 or 2 | 3 | Heat Engineering | Graduate elective |
| | | Refrig. and A.C. Lab. | 2 | 3 | Heat Engineering | 4th year elective |
| Medford | Tufts College | Heat., Vent., and A.C. | 1 | 3 | Physics (Heat) | |
| | | Refrigeration | 2 | 3 | Thermodynamics | |
| Worcester | Worcester Polytechnic Institute | A.C. and Refrigeration | 1 | 2½ | Thermodynamics | Senior elective. Includes heating projects |
| MARYLAND | | | | | | |
| College Park | University of Maryland | Heating and A.C. | | 3 | Thermo.; Fluid Mech. and Heat Transfer | } Senior courses |
| | | Refrigeration | | 3 | | |
| MICHIGAN | | | | | | |
| Ann Arbor | University of Michigan | Refrigeration and A.C. | 2 | 3 | Thermodynamics | Elective |
| | | Industrial A.C. | | 3 | Thermodynamics | Requir. for industrials; elective for others |
| | | Heating and A.C. | | 3 | Thermodynamics | Req. for mechanicals |
| | | Design of Heating and A.C. Systems | 2 | 3 | Thermodynamics | Elective |
| | | A.C. Laboratory | 2 | 2-3 | Thermodynamics | Elective |
| | | Heating and Vent. | 2 | 2 | Thermodynamics | For senior architectural students |
| | | Indust. Exhaust and Ventilation Lab. | 2 | 2 | Thermo. and Ind. A.C. | Senior and graduate elective |
| | | Studies in Natural Ventilation | | 2 | Thermodynamics | Graduate elective |

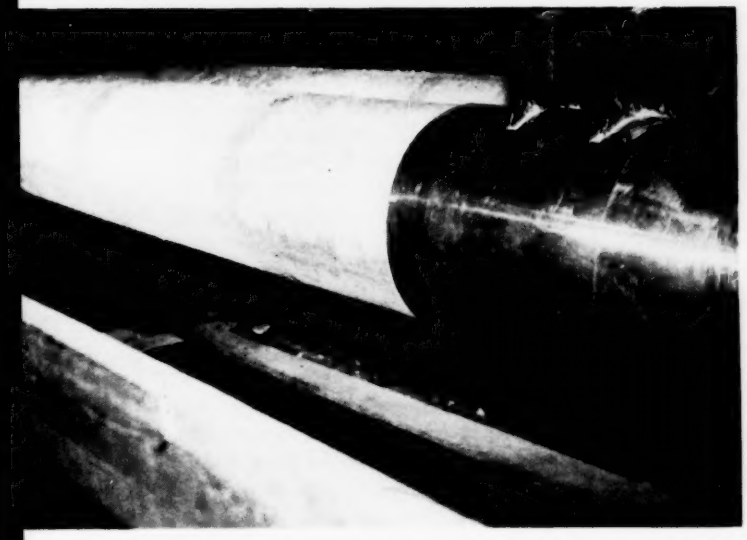
*(Concluded in following issue)*

(Left) Four Kimble Glass Company sections are the only source of daylight in this mock-up classroom erected on the roof of the Engineering Research Institute at the University of Michigan. This Toplite System consists of panels of glass units and aluminum which are factory fabricated ready for installation in the roofs of buildings. They combine low solar heat transmission in summer months and good insulation during cold weather with uniform light transmission throughout the year.

(Above) Air travel has received another aid with the appearance of a mobile heating and air conditioning unit produced by Airtemp Div., Chrysler Corp. Mounted on a standard truck body, the unit consists of a 7-cylinder, 40 hp radial compressor and a 200,000 Btu per hr gasoline-fired aircraft heater. The compressor is directly connected to a 150 hp, 6-cylinder truck engine. Water storage tanks are located underneath the truck body. Cooling coils and heat exchanger are mounted in the ductwork inside the truck body. The ducts terminate in a long flexible hose which is connected to a duct in the plane's ventilation system. System pre-heats or pre-cools plane's interior before passengers board the plane.

# Picture Paragraphs

(Below) From curb entrance to exit, the 90 by 9-foot driveway serving Camden Trust Company's new drive-in teller's window at Haddonfield, N. J., is kept dry by this under-the-pavement snow melting system. These wrought iron pipe coils, shown during installation, carry heated water, mixed with anti-freeze, to warm the driveway's concrete pavement.



(Above) Steam leaves the boiler at 1,000F and travels 650 ft through the main steam line to the generator with a 10½ degree drop in temperature at Toledo Edison's Acme plant. The steam line is insulated with two layers of 2½-inch Kaylo heat insulation applied in tri-segmental units. A .020-inch aluminum jacketing covers the insulating material.

# How Higher Courts Have Ruled

LEO T. PARKER

Attorney at Law, Cincinnati, Ohio

**From this group of higher court decisions, heating and ventilating contractors and sellers of equipment will find legal guidance to avoid costly law suits.**

DURING 1952, the higher courts rendered many outstanding decisions, knowledge of which will enable readers to avoid similar legal controversies. And these late citations can be advantageously used by readers and their lawyers to win unavoidable law suits. Also, I shall answer some legal questions asked me, while on a recent trip, by heating contractors and officials and employes of heating equipment sale companies. Readers will do well to clip and file away this article for future reference.

### Implied Guarantee

Modern higher courts consistently hold that if a buyer makes known to the seller or contractor the particular purpose for which goods, merchandise or equipment are being purchased, there is an implied warranty that the goods, merchandise or equipment shall be "reasonably fit" for such purpose.

For example, in Wallower v. Colorado Supply Company, 247 Pac. (2d) 682, the testimony showed facts as follows: One day a man, Wallower, consulted a seller for the purchase of a Heil heater or dryer. Wallower purchased the dryer. Soon afterward Wallower arranged with the seller for purchase of certain used equipment to be operated in combination with the dryer. When put to the test, the used equipment failed to operate properly in connection with the dryer. After continued efforts to repair and make the equipment operate satisfactorily, Wallower was never able to make it produce its fullest capacity and on account of shutdowns he sustained loss and damage. He finally gave the seller notice of rescission of his contract; made demand for return of the purchase price money; and finally wrote a letter of rescission.

In the resultant suit Wallower asked the court to decide that the seller had breached an "implied" warranty because the seller had sold him the used equipment with the specific knowledge that it was to be used in connection with the dryer.

The suit was condensed into a simple problem, as follows: Wallower claimed that the seller was responsible on an implied guarantee that the equipment was reasonably suitable for the purposes for which he, the seller, knew it was to be used. Wallower asked the court to award him a judgment of $1,907.40 paid on his note, and damages of $582.48 which he paid out for materials and labor because of the breakdowns, and an additional $2,668.20 for loss of earnings from the Heil dryer due to the inability of the used equipment to meet the reasonable requirements for which it was needed, as he had explained to the seller.

After considering all testimony the jury rendered a judgment for Wallower. The higher court approved the jury's verdict, thereby holding the seller liable to Wallower. The court said:

"The next, and controlling, question in this controversy is: Was there an implied warranty on the part of Elder, the seller? The sales act clearly provides for an implied warranty that the goods be reasonably fit for the uses, made known to the seller by the buyer, for which they were purchased."

### Validity of Lien

A legal question presented to me a number of times is substantially as follows: "If a tenant or the owner of a mortgaged or encumbered building, orders a contractor to install a new heating system or contracts for repair work, does the contractor have a lien? What can a contractor do to be certain to collect for the job or repairs?

The answer to one question is: Yes, even without the consent of the holder of a recorded mortgage, or conditional contract; to make the repairs, the contractor can perfect a lien on the real property. However, a majority of higher courts hold that unless a contractor obtains this consent, he does not have a first lien, but a secondary lien subject to the mortgage or conditional contract. In other words the higher courts very consistently hold that a properly recorded mortgage or conditional contract of sale always is superior to any other lien, including a mechanic's lien, unless the contract of sale shows that the holder of the mortgage or conditional contract of sale expressly or impliedly consented to having the installation or repair work done.

It is important to know that a recent higher court held that consent to making repairs is implied where the testimony shows that the holder of the mortgage or conditional contract of sale knew that the repairs were being made and made no objection. See Lincoln Corporation v. Morgan, 90 N. E. (2d) 522. Here the testimony showed that a mortgagee saw the contractor making the repairs and did not tell the contractor that he would not be responsible for payment for the repairs, and he did not inform the contractor that he would pay the bill.

In subsequent litigation, the higher court awarded the contractor a valid mechanic's lien, and said:

"We think the evidence in this case was sufficient to show that the mortgagee consented to the making of the repairs and to the subordination of its lien. At the very least, the mortgagee would be stopped from asserting a priority if he stood by in such a manner as to induce the serviceman to do the work.

### Owner Has no Knowledge of Work

According to a late higher court decision a property owner never is liable for payment of installation or

repair work ordered by a tenant, if the testimony shows that the property owner had no knowledge that the work was being done.

For example, in Harold Furnace Company v. Johnson 103 N. E. (2d) 407, the testimony showed: Mr. Johnson was the owner of the property at 9117 Blaine Ave. at the time of the installation of a furnace. Mr. Alexander was a tenant who gave to the Harold Furnace Company a written order or contract for the installation of the furnace and made all the necessary arrangements in connection therewith.

The Harold Furnace Company sued both Johnson, the owner of the residence, and Alexander, the tenant, to recover $404.01, the amount specified in the contract between the furnace company and the tenant. The counsel based its suit against Johnson upon two theories of law: (1) implied agency, and (2) unjust enrichment.

The furnace company introduced no testimony proving that Johnson had given his consent to installation of the furnace. In fact the testimony showed that the furnace was installed by the Harold Furnace Company at the insistance of Alexander, without knowledge and consent of Johnson.

The counsel for the furnace company argued that Johnson should be compelled to pay for the furnace because he derived benefit from the installation of the furnace when later he sold the home, at a price more than he could have obtained had the furnace not been installed in the dwelling.

Nevertheless, the higher court refused to hold Johnson liable, saying:

"We have examined the record very carefully, and we find no evidence from which an inference can be drawn to support the claim of an implied agency. This corroborates the testimony of the defendant, Johnson, completely and therefore the claim of unjust enrichment is wholly lacking in evidentiary support."

### Worthless Merchandise

A reader asked this question: "Under what circumstances can a heating contractor sell and install worthless merchandise or equipment and not be liable to the purchaser?"

The answer is: Only when a seller sells a patented article without attempting to select the particular equipment especially suitable for the buyer's intended purposes.

Subsection (4) of Section 81-1-15 United States statutes provides:

"In the case of a contract to sell or a sale of a specified article under its patent or other trade name, there is no implied warranty as to its fitness for any particular purpose."

However, as above indicated, this United States law is not applicable if the seller himself selects the size or capacity article or device, or equipment he believes will suit the buyer's purposes.

For illustration, in Hubbard v. Denn, 214 Pac. (2d) 118, the testimony showed facts, as follows: The owner of a store wanted an air conditioning system. He contacted a contractor who installs heating and ventilating equipment. Later the contractor wrote a letter to the store owner in which it was stated that he would furnish and install a "7500 H Evaporative Cooler," with all necessary fittings and grill for the sum of $870. The store owner accepted the terms and the contractor installed the air-cooler on the balcony in the upstairs of the store. The conditioner failed to substantially decrease the temperature, and it caused a musty odor. A thermometer was placed in the store in July and August and testimony was given that the temperature in the store with the conditioner in operation was 98 degrees in the front of the store, and 94 degrees in the rear near the cooler.

The store owner refused to pay the contract price for the equipment and installation, and the contractor filed suit.

The higher court held that the contractor could not collect the contract price, saying:

"The plaintiff (contractor) was aware that defendant (store owner) knew nothing about air-cooling equipment and he was also aware of the fact that the principal object of the negotiations and subsequent sale was to provide a suitable cooling system for defendant's store. The fact that an article has a trade name does not negative an "implied" warranty of fitness for a particular purpose where it is purchased, not by name, but for a particular purpose and supplied for that purpose."

### Must Prove Damages

No person, or corporation, who sues for damages can have a favorable verdict unless he proves to the court the amount of damages he sustained. This rule of law applies to contractors, sellers and all other business firms.

For example, in Comstock v. Coronet Heating Company, 245 Pac. (2d) 357, it was shown that one Comstock is a dealer in equipment. He alleged that the Coronet Heating Company breached a contract made with him for the exclusive distribution of its products such as heaters, and including plumbing supplies.

Comstock failed to prove how much he was damaged by the breach. Hence, the higher court refused to allow any damages, saying that a court cannot and will not speculate on the amount of damages sustained by a complaining party.

### Purchaser Defaults

Considerable discussion has arisen from time to time over the legal question: "Is a sale contract valid and enforceable by which a heating contractor or seller is given the right to take possession of equipment or merchandise from a purchaser, keep it and all prior payments made by the purchaser, if the purchaser misses one single installment payment?"

According to a late higher court decision the answer is, yes.

For instance, in Rutledge v. Universal, 237 S. W. (2d) 469, the testimony disclosed that one Rutledge bought certain equipment and signed a conditional sales contract which contained this clause: "If the customer (purchaser) defaults on any obligation under this contract, the full balance shall without notice become due forthwith . . . Customer (purchaser) agrees in any such case and the holder (seller) may, without notice or demand for performance or legal process, enter any premises, take possession, and retain all payments. Customer shall pay any remaining balance forthwith as liquidated

damages for the breach of this contract and shall receive any surplus."

After making six monthly payments the purchaser became behind with his payments. Some days later the seller repossessed the equipment.

In subsequent litigation the higher court held that the seller was justified in taking possession of the equipment and further that the purchaser must lose or forfeit the payments he had made. This court said:

"Where a vendor sells certain property, to be paid for in installments by the vendee, and enters into a written contract with the vendee, retaining the title to the property, with a stipulation in the contract that, if any of the installments are not paid, the vendor 'shall have the right to take possession of said property without any legal process, and all payments made up to the time of default shall be applied as rental for said property and depreciation in value,' the contract is one of conditional sale. Where the vendee defaults as to some of the payments, the vendor, as between himself and the vendee, nevertheless has the right under the contract so far as mere possession of the property is concerned, to remove it without any legal process."

For comparison, see Ellis v. Smithers, 206 Ark. 247. This court held that a seller has a lawful right to take possession of merchandise or equipment without legal action just so long as he did not use any force, deception or fraud, providing the conditional contract of sale so provides.

### Fixture Cannot be Removed

Notwithstanding the previously explained law under no circumstances may a seller or a contractor take possession of merchandise and remove it from a building if the removal will effect permanent damage to the building.

For example, in Potter's Estate, 111 N. Y. S. 371, it was shown that a son lived in his father's dwelling. The son converted the heating plant in the house from a coal burner to an oil burner. This was accomplished by the purchase of an apparatus which was designed, after the grates had been removed, to be installed in the furnace. The son paid for this improvement. Later the father died and the heirs became owners of the home. The son claimed that because he had paid for installation of the oil burner, he could, when he desired, remove it from the building.

The higher court refused to allow the son to remove the oil burner, because the installation required a "feed pipe" connection. This pipe was conducted into the interior of the home by means of a hole drilled through the wall. It could not be removed without some injury to the real property. The court said:

"Moreover and in any event, as to who paid the purchase price, it appears that the so-called "oil burner" became attached to and a part of the real property and should, therefore, be regarded as a fixture. Evidence in support of such a determination in regard to this apparatus is that it was fitted into the existing heating unit in such a manner that it thereupon became an integral part of this heating plant, which, unquestionably, was a fixture. The oil burner having become a fixture, regardless of whether or not Daniel (son) personally paid the price of it or any part thereof, he had no more right to remove it than he would have had to have torn off and removed some of the roofing, siding, or other material identified with the construction or repairs of the house which he might have paid for."

### Insurance Law

A reader asked this question: "Sometime ago I instructed my regular insurance agent to insure my buildings. He promised he would do so. Now, I find after one outlying building burned that it is not included in the policy. The insurance company refused to pay the loss. What am I to do?"

A review of late and leading higher court decisions disclose that a great many insurance law suits result from misunderstandings of heating contractors with insurance agents. There are two kinds of insurance agents. One class is known as "special" agents. This agent is the one who may call at your place of business and solicit your insurance business. The other is a "general" agent who usually manages and supervises a branch office of the insurance company.

The higher courts consistently hold that an ordinary or "special" insurance agent is your representative and not an agent of the insurance company. Hence, the courts hold that the insurance company is not in any sense liable for promises made by the special agent. Irrespective of what your special insurance agent promises and no matter what protection you believe your insurance policy includes, you must rely exclusively upon the protection defined by the policy.

For illustration, in Ferla v. Commercial Casualty Insurance Company, 59 Atl. (2d) 714, it was shown that an insurance policy had a typewritten endorsement which limited the insurance coverage. Subsequently the insurance company refused to pay a loss and the insured filed suit. He testified that when he applied for the policy he told the special insurance agent to issue a policy that would cover his losses. Nevertheless, the higher court refused to hold the insurance company liable.

This court held that if a special insurance agent is authorized merely to solicit applications for insurance, he cannot bind the insurance company.

### Contractor Locates Air Vent

Considerable discussion has arisen from time to time over the legal question: "If a contract does not specify where heating equipment accessories, etc., shall be located, can the contractor without future liability select the location?"

According to a higher court decision rendered recently, the answer is yes, if the contractor violates no state, county, or city law.

For example, in Hood Construction v. Clark, 107 N. E. (2d) 37, the testimony showed facts as follows: A contractor when installing an oil tank placed the air vent against the face of the property owner's building.

The higher court held that no city ordinance prohibited locating the air vent adjacent to a building, and since the contract between the contractor and the property owner did not specify where the air vent should be located, the contractor was within his legal rights in locating the air vent in the location he selected.

# Design of Kitchen Range Hoods

**J. M. DallaValle**, Georgia Institute of Technology, Atlanta, Georgia

HEATING and VENTILATING'S REFERENCE SECTION

# Design of Kitchen Range Hoods

J. M. DALLAVALLE

Professor of Chemical Engineering, Georgia Institute of Technology, Atlanta, Georgia

The need for supplying some basis for estimating air requirements of kitchen hoods is apparent. It is emphasized to a greater degree with the advent of air conditioning in most modern kitchens. Since recirculation is usually not advised, it is essential to provide as precisely as possible what is needed for kitchen hoods to perform efficiently. Underventilation of hoods in air conditioned kitchens can create many nuisance problems, while overventilation can make for burdensome operating costs.

**Mr. DallaValle has been associated with the Georgia Institute of Technology since 1948. His current interests are concerned chiefly with research on the surface properties of fine particles and with the aggregation or "ageing" of aerosols. Prior to his associations with Georgia Tech, Mr. DallaValle was active in the field of industrial hygiene and was particularly interested in studies of hood air flow patterns. The present article is an outgrowth of his continued interest in this field and is largely developed from a thesis on canopy hoods by a former student, Mr. Frank Thomas (see H & V, April, 1950). Mr. DallaValle is the author of several texts, including Exhaust Hoods, recently published by The Industrial Press. This book deals with fundamentals of hood design for the control of industrial dusts, fumes, vapors and gases.**

HOODS used in restaurant and hotel kitchens and in ship galleys have received a great deal of attention as regards appearance. They are more elaborate than industrial hoods, being made of stainless steel or aluminum and suspended so as to offer a minimum interference to operations they are designed to control. Also, unlike all other types of hoods in general use, kitchen hoods are usually equipped with grease filters which extend over the whole of the hood opening.

It is apparent from the foregoing that kitchen-type hoods are costly to install and maintain. Yet, though their form of structure is well-established and they are in many instances artistically perfect, relatively little information is available for calculating the air needed to assure efficient performance. Considering that kitchen hoods are usually of large size and handle up to 10,000 cfm, it is indeed rather surprising that such a state of affairs continues to exist. Where installations are underdesigned, insofar as air requirements are concerned, ceilings and fixtures become coated with grease and maintenance of sanitary conditions becomes a problem. Overdesigned ventilation is expensive from the standpoint of both initial equipment cost and operating cost.

Ventilation by a kitchen hood should be such that, over the area in which it is expected to function, all air currents are directed into the hood. These currents should be of such velocity that, over the perimeter of the area contributing to odors and vapors, they are not affected by cross currents created by opening and shutting of doors, window drafts, and mechanical ventilation associated with other operations. A useful rule to hold in mind in this connection is that the body is relatively insensitive to air movements of less than 30 fpm. Air velocities greater than this amount often create some physical discomfort. Hence, cross-drafts are usually kept below this amount, and a hood would be expected to provide at least 30 fpm over the operating periphery furthest removed from it, e.g., above the edge of a range, or deep fat frier.

As a matter of fact, a velocity of 30 fpm at the remotest periphery of interest is adequate. For one may expect a contribution from the chimney effect generated by the hot surfaces to which kitchen hoods are usually app'ied. It is indeed rare that velocities in excess of 30 fpm are needed over the periphery of interest, but having provided for it, we can expect considerably higher rates wherever the hood is applied to a heated area. However, it is good practice to allow for stray ventilation cross-currents where they are known to exist.

There may be situations where 30 fpm control velocity requires so much air, especially if the hood is large and the room small, as to cause serious disturbances. In such cases, the control velocity may be reduced to 10 fpm provided the hood is lowered to a minimum distance from the operating surface and the open areas not in use are covered with suitable metal shielding.

One of the chief variables to be contended with in kitchen hood design is the distance between the surface over which control must be established and the hood opening. These are rarely the same in any two installations. Since the distances between the hood opening and the periphery of interest greatly affect the air volume requirements, it is advisable always to keep the hood as near the working surface as possible without interfering with operations or affecting overall appearance. The latter item is of concern in these days since the public is often invited to inspect kitchens, and good will is gained by a neat appearance.

There is, finally, one more troublesome item to be discussed. It concerns the ratio of the area of the hood to the area of the surface over which it must function. This matter is regulated by ordinances in many cities and, of course in such cases, we must adhere to the requirements there stated. Where the matter is not regulated, it is customary to increase the dimension of the hood 2 inches for every foot of distance between the hood opening and the operating surface (range, frier, cooker, etc.). Actually, this is not too important, provided the area of the hood conforms to the area of the operating surface since the effective area of a hood is always greater than its open area, and increases with distance. There is also to be considered the fact that the open area is often

Photo on frontispiece of this section is of the kitchen in the new Statler Hotel in Los Angeles.

governed by the size of grease filter units which can be installed conveniently.

## Ventilation Design Principles

In this brief article, only the basic ventilation principles involved in the design of kitchen hoods will be outlined. Procedure for estimating air volumes so that a hood will perform efficiently will be indicated. Estimates will be based on an air velocity of 30 fpm over the operating surface for hoods of different sizes and construction and located at various distances from the operating surfaces. We shall rely heavily on the work of Thomas (H. & V., April, 1950) and in several instances on the personal experiences of the author.

There are, in general, two types of hood to be considered. The most common is the shed-type which extends outward from a wall. Such hoods have three operating sides. The second type is one which is freely suspended over the surface it must control and has four operating sides. Both types of hood are classed as canopy hoods, and it will be assumed that the hoods are provided with grease filters which will be discussed in detail.

We shall not discuss ventilating equipment, such as fans and motors, but assume that they are adequate to provide the air volumes needed against the overall resistance of the system as a whole. It is well, however, to indicate that when grease filters are used, their resistance to flow may increase from 0.2 inch w.g. (when clean) to as high as 0.5 inch w.g. when they are dirty. Thus, fans must often perform against as much as 1 inch w.g., or more if extensive duct work is employed. The characteristic pressure-volume curve of the fan used is therefore quite important, and one must be certain that the volume does not decrease too much as the resistance in the system increases. The tendency to use propeller type fans indiscriminantly should be discouraged.

## Shed-Type Hoods

Hoods toward which normal flow of air is obstructed by an extended surface were investigated by Thomas, and his work permits certain general conclusions regarding the performance of such hoods. This class of hood was also discussed by the author (DallaValle: Exhaust Hoods, Industrial Press, 1952) and reference is made to his work in this connection.

In order to simplify matters, units of measure will be expressed in terms of the hood width, $W$. Thus, a hood of length $2W$ is one twice as long as it is wide. If the distance of the hood opening from the operating surface is $2W$, then the distance is two hood widths. The value of this procedure lies in the fact that hoods which are geometrically of the same form, and spaced from the working surface by the same relative distance, can be reduced to a simple unit system of evaluation. When geometrically similar hoods and obstructional arrangements are reduced to a unit system, then, regardless of the actual dimensions involved, the velocity distributions expressed as percentages of the velocity across the hood opening will be the same for all such hoods. The following example taken from Thomas' paper serves to illustrate this point. Fig. 1 shows a shed-type hood having a ratio of sides 1:2, that is, the length is twice the width. Taking the width, $W$, as the standard dimension, then the length $L$ is $2W$. The obstructing surface is at a distance equal to the width of the hood. The velocity contours are the curves marked A, B, and C and represent surfaces of constant velocity. These velocities are expressed as percentages of the velocity at the opening. Thus, in a design for a velocity of 30 fpm at the larger edge of the range shown, contour A shows that velocity at this edge is 25% of the velocity at the opening. Hence, the velocity at the opening must be 30 0.25 or 120 fpm. Expressed on a volume basis, 120 cfm are needed for every square foot of hood opening.

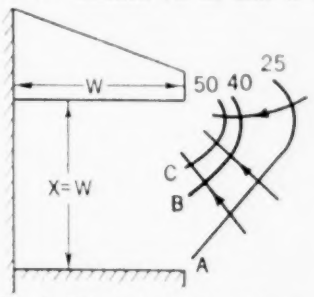



Fig. 1. Thomas' velocity contours and streamlines for a hood with opening ratio 1:2 located at a distance equal to the width of the hood, W, from a plane surface. Note that contour A contacts edge of the surface. The same contours would apply to a square hood, freely suspended at a distance of W/2 from the surface.

Fig. 2 shows conditions applying to shed-type hoods having a ratio of sides 1:2 at various distances from the operating area. Beside each hood is indicated the velocity required at the plane of the hood opening to provide a minimum velocity of 30 fpm about the periphery of the operating area. If higher velocities are required at this periphery in order to overcome cross currents, the values may be increased by the ratio of the new velocity to 30 fpm.

Fig. 3 shows the same conditions for a hood having a ratio of sides 1:4. Fig. 4 summarizes the essential information in the form of 3 curves. It is rather surprising that larger hoods require less air per unit area than smaller ones. However, it is to be especially noted that as the distance between the hood opening and operating area increases, the volume requirements become exceed-

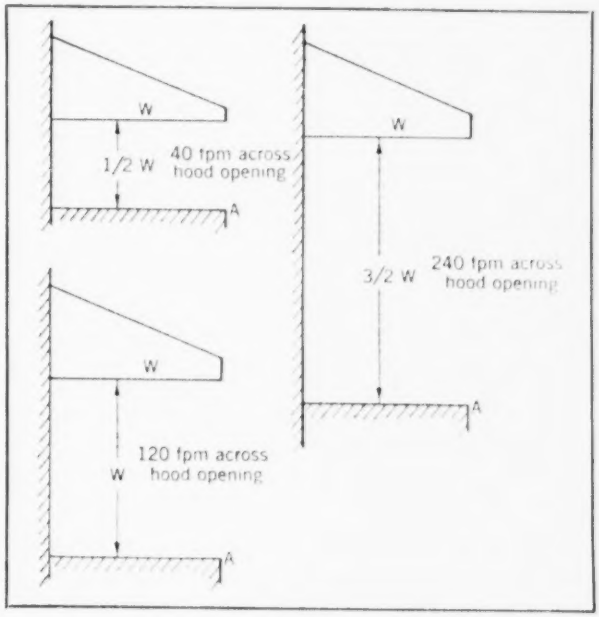



Fig. 2. Velocities across shed-type hood opening for hoods having a side ratio 1:2, based on provision of 30 fpm at A.

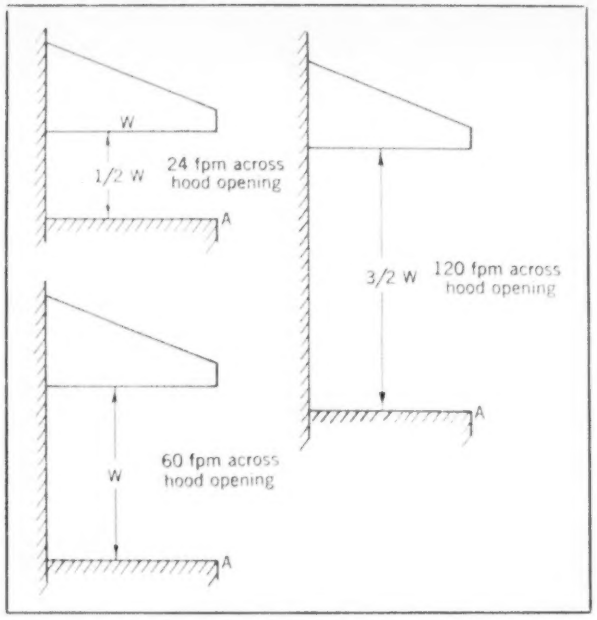



Fig. 3. Velocities across shed-type hood opening for hoods having a side ratio 1:4, based on a provision of 30 fpm at A.

ingly high. Thus, in such cases, the air volume cannot be handled by grease filters located in the hood, and air noise can become a serious nuisance.

The curves represented by Fig. 3 can be represented by a form of equation due to Thomas so as to fit any desired situation. This equation applies to all hoods

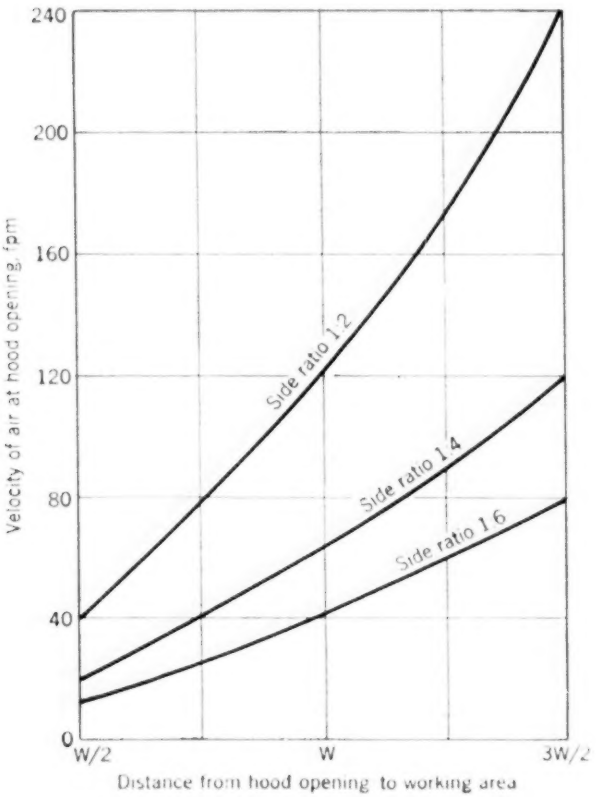



Fig. 4. Relation between air velocity at hood opening and distance to working area expressed in terms of hood width, W, for rectangular hoods with different side ratios.

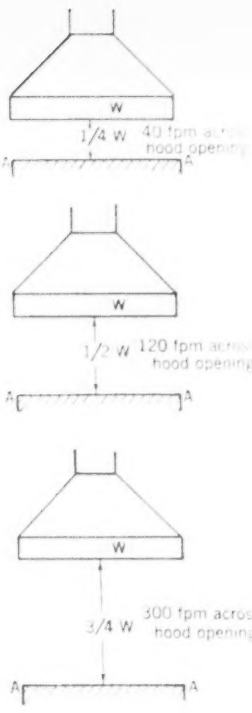



Fig. 5. Velocities across center-suspended hood opening for hoods having a side ratio 1:2, based on provision of 30 fpm at A.

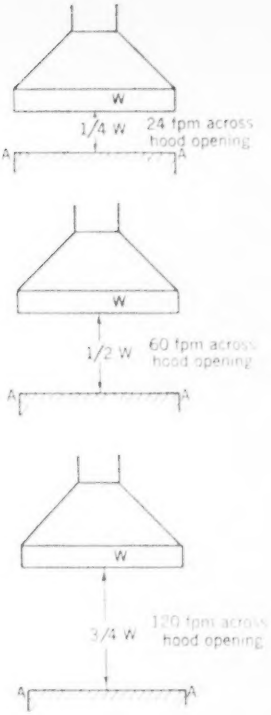



Fig. 6. Velocities across center-suspended hood opening for square hoods, based on provision of 30 fpm at A.

where opening side ratios are 1:2 or greater.

$$Q = 8.5\ u\ W^{0.2}\ X^{1.8}$$

where $Q$ is the volume of air to be handled by a hood having a width $W$ ft located at a distance $X$ above the operating surface. The term $u$ is the velocity selected above the operating periphery (in our case 30 fpm).

## Freely Suspended Hoods

Suspended hoods providing access on four sides are not commonly used in kitchens, but do possess certain merits. Freely suspended hoods are more subject to cross-currents than are the shed-types. Also, due to the fact that they have an extra side, air requirements are correspondingly greater. Discussion of air requirements for these hoods is drawn directly from the Thomas investigations.

Fig. 5, 6, and 7 give the essential data for square and rectangular hoods, the latter having a side ratio 1:2. As in the preceding paragraphs dealing with shed-type hoods, the curves are based on producing velocities of 30 fpm about the operating periphery. Data for hoods having smaller side ratios than 1:2 are lacking and must be extrapolated. Thomas' equation for a freely suspended square hood is

$$Q = 14.5\ u\ W^{0.2}\ X^{1.8}$$

It will be found that the data plotted in the upper curve of Fig. 7 conform very closely to values computed from this equation, taking $u = 30$ fpm. A suitable equation may be derived for rectangular hoods having a side ratio 1:2, but in the absence of data pertaining to other side

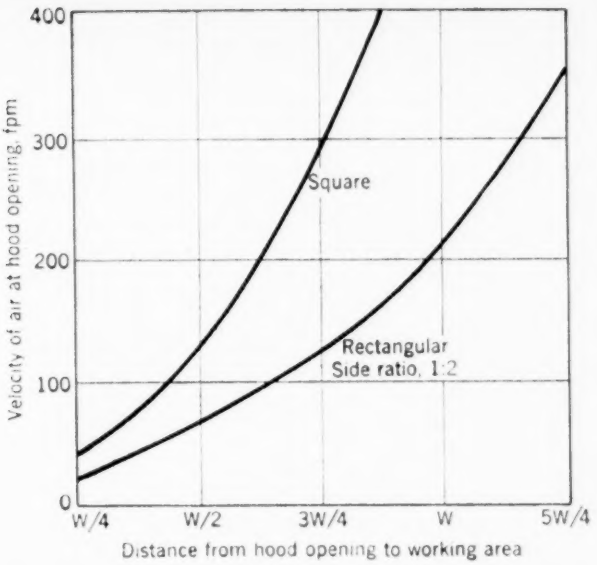



Fig. 7. Relation between air velocity at hood opening and distance to working area expressed in terms of hood width, W, for square and rectangular hood of side ratio 1:2, the hoods being freely suspended over the working area and accessible on all sides.

ratios, it seems to restrict our efforts and refer only to the values represented in Fig. 7.

## Examples

Two examples on the use of the information given will suffice to indicate the manner along which the computations should proceed.

(1) *Shed-type hood over range.* Calculate the air requirements of a hood 5 ft by 10 ft located 6 ft above the surface of a range. Assume a velocity of 30 fpm is adequate for controlling the vapors during cooking. Then,

$$\text{Ratio of sides} = 5{:}10 = 1{:}2$$

$$X = 6/5 = 1.2\ W$$

using the upper curve of Fig. 4, find that the velocity over the hood opening should be 140 fpm or, what is the same, 140 cfm per sq ft of opening. Hence, the air volume need is

$$5 \times 10 \times 175 = 8750 \text{ cfm.}$$

Should we have calculated this requirement by means of equation (1), then, since u = 30, W = 5 and X = 6

$$Q = 8.5 \times 30 \times (5)^{0.2} \times (6)^{1.8}$$

$$= 8.5 \times 30 \times 1.38 \times 25.0 = 8800 \text{ cfm}$$

The agreement is seen to be close.

(2) *Freely suspended hood over range.* Now suppose the same hood is located so that all four sides of the range are accessible. In this case, use the lower curve of Fig. 7 and, for X/W = 1.2, the air velocity into the opening of the hood should be 290 fpm or 290 cfm per sq ft. Hence the air volume to be handled by the hood in order to produce a velocity over the working periphery of the range 30 fpm should be

$$Q = 5 \times 10 \times 290 = 14{,}500 \text{ cfm.}$$

In this case, the volume of air needed is almost double that for the shed-type arrangement.

## Ventilation Design Variations

There are three items needing further discussion and these pertain to the use of (a) wall slots in connection with shed-type hoods, (b) the use of local exhaust hoods for deep fat friers and (c) provisions to be made for air conditioning. Each of these items has proved troublesome and some clarification is in order.

Wall slots should be discouraged. They not only increase construction cost, but they add little to the general effectiveness of the hood itself. They are also difficult to keep clean because of their inaccessibility. If occasion arises where such a method is needed because of overhead space limitations, the slots should be made wide enough to permit access for cleaning. Grease filters should not be used near slots if there is any danger from ignition. They should be located at a safe distance along the exhaust duct, but not so far that the accumulated grease in the duct return preceding it can give trouble. For slot-type exhaust, the air volumes can be calculated from the formula,

$$Q = 100 \times L \times W$$

where $L$ is the length of the surface over which the slot must function and $W$ the width of the surface. Slots are not effective over distances of much more than 3 ft.

Deep fat friers can be exhausted locally, that is by an arrangement such as shown in Fig. 8. Air volumes in such cases can be estimated by multiplying the open peripheral area in between the hood and frier in sq ft by 50, the latter figure representing the velocity of the air through the area is fpm.

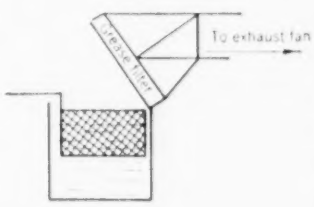



Fig. 8. Suggested hood arrangement for a deep fat fryer.

If the kitchen is provided with air conditioning, care should be taken in arranging the air inlets. These should be located so that the air flow, by the time it reaches the area serviced by the hoods, is reasonably parallel to the floor and ceiling. In other words short-circuiting should be avoided or minimized as much as possible. Smoke tests are always indicated to evaluate the performance of the hood in such instances and changes made so as to assure a uniform flow of conditioned air.

## Grease Filters

Grease filters are not only advisable for large kitchen hoods to remove oily vapors and droplets, but also because they serve as excellent diffusers and assure a uniform distribution of air over the hood opening. Grease filters are made to standard dimensions and vary from 1 to 3 inches in thickness. They are constructed of metal mesh and louvered strips. They have a relatively high internal area, and have excellent holding capacity. Thick grease filters are needed in hoods which operate continuously.

The need for keeping filters clean cannot be stressed too strongly. When heavily coated with grease, they not only drip excess, but are also serious fire hazards. Grease filters are usually constructed and installed so as to be easily removed from the hood for cleaning. The accumulated grease can be washed with hot water and suitable detergents. Some manufacturers seek to improve collect-

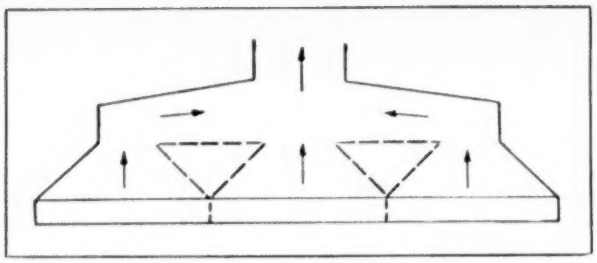


Fig. 9. Suggested method for subdividing a long rectangular hood to assure uniform flow into its opening.

ing efficiency by dipping the clean filter in a liquid having adhesive properties, then permitting it to drain before installation.

In some designs, the grease filters are tilted slightly to permit drainage of excess grease and oil collected into channels which in turn drain to a predetermined point. Filters must be arranged in a *I* or *W* form if large air volumes are handled which exceed the manufacturers recommended operating velocities through them. The filter area can be increased in this way.

Most grease filters are designed to handle from 150 to 250 cfm per sq ft of filter area. Resistance to flow varies from 0.02 to 0.1 inch water gage when clean. After a period of operation, it is not uncommon to find the resistance increased to as much as 0.5 inch w.g. It is, therefore, very important that the exhaust fan used with the hood provide the calculated air volumes over the range of filter resistance pressures.

### Overall Design Features

Because of the large size of kitchen hoods, there is always a problem of achieving a uniform flow of air over the hood opening. While grease filters aid in distributing the air flow uniformly, they are not always adequate. It is an axiom of good hood design to make certain that the flow into the opening is uniform. This problem offers no difficulty with small hoods up to 5 ft square unless the overall height is low and there is no opportunity to obtain a uniform distribution due to short-circuiting of the exhaust duct. It is with long, rectangular types that care must usually be exercised.

The easiest and most practical method of obtaining a uniform flow through a hood opening is to subdivide the hood. A suggested scheme for doing this is shown in Fig. 9. Another method is to insert plate baffles within the hood, but this should be used only if grease filters are installed.

A word of caution must here be expressed with regard to all types of hoods. It must always be remembered that hoods exhaust air and that this air must be replaced. Thus, suitable inlets must always be provided. A deficiency of inlets, or placement of inlets so that short-circuiting of air results, prevents the hood from functioning properly and can cause inefficiency. The provision of adequate inlets is often overlooked and poor hood performance is wrongfully blamed on the exhaust fan. As we have already pointed out, proper location of inlets becomes exceedingly important in air conditioned kitchens and serious attention should be given to this item.

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## Corrosion of Low-Alloy Irons and Steels

The extensive use of low-alloy, high-strength steels in many kinds of above-ground construction is based largely on the fact that these steels corrode more slowly than plain carbon steels under most atmospheric conditions. Unlike steels containing high percentages of alloying metals, low-alloy steels are not inherently resistant to corrosion. Instead, they owe their corrosion resistance to the development of an adherent layer of corrosion products, which reduces further corrosion to a negligible or at least tolerable rate. Since these protective deposits develop normally under conditions of good aeration, the usefulness of low-allow steels as a class for underground construction would seem to depend on their ability to develop and retain protective deposits under the conditions of deficient aeration which are characteristic of corrosive soils.

A recent study by the National Bureau of Standards provides new information on the corrosion of certain low-alloy irons and steels in soils. Specimen plates of several of these materials (containing up to about 6 percent of total alloying elements) together with reference specimens of plain steel, were buried at 15 different test sites for periods up to 13 years.

Included in the Bureau's study, which was conducted by I. A. Denison and M. Romanoff of the NBS corrosion laboratory, were specimens of copper-molybdenum open-hearth irons, nickel-copper steels, and chromium steels with and without molybdenum. Sets of specimens were removed at regular intervals over the 13-year period, and after removal of corrosion products the weight losses and depths of the deepest pits were measured.

The steels containing 4 to 6 percent of chromium generally lost only about half as much weight as did plain steel under the same conditions. However, the greater corrosion resistance of the alloy steels as measured by weight loss was not generally accompanied by a corresponding reduction in the maximum depth of pits. The least pitting was observed on specimens that contained molybdenum in addition to chromium.

The change in the rate of pitting with time was found to depend on the composition of the steel. Although the initial rate of pitting was greater for the alloy steels the depths of the deepest pits in the alloy steels were usually less than in the plain steel. This indicates that after the maximum period of exposure the alloying constituents induce the formation of corrosion products which tend to reduce the rate of pitting with time. In an environment unfavorable to the development of protective deposits of corrosion products, the alloy steels could be expected to develop deeper pits than plain steel because the greater initial rate of pitting of the alloy steels would tend to be maintained. This tendency toward accelerated pitting of alloy steels was actually observed in a few highly reducing soils in which the deposition of a protective scale was impossible because of the solubility of the corrosion products.

# What Would You Do?

## Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

STEAM traps are items of general interest in a plant. Therefore, the current discussion dealing with the use of traps in steam unit heater installations should be of value to a large number of plant engineers.

Should you have a question that you would like to see discussed in this department, or if you have some comments that you would like to add to the discussion scheduled for the coming issue, you are invited to write to the Editor.

### This Month's Problem

**Most manufacturers of unit heaters (steam) show suggested piping hookups in their catalogs and usually they include one or two arrangements omitting a return trap. In commercial and industrial work, most unit heaters are connected with two-pipe steam systems under positive pressure and the return line is usually high. When and where is the elimination of traps in unit heater installations justified?**

### Answers to this Month's Problem

Naturally, as a steam trap manufacturer, we cannot wax enthusiastic over the elimination of traps in unit heater installations. Traps, of course, could not be used with a two-pipe gravity return system. This type of return system is sometimes seen in small stores or garages, where the boiler is located in the basement and the steam pressure is low enough so that the condensate can go back to the boiler by gravity.

When this type of condensate system return is used, each unit heater should be provided with a separate air vent. With this sort of system, short circuiting is almost bound to occur, particularly if the heaters are thermostatically controlled.

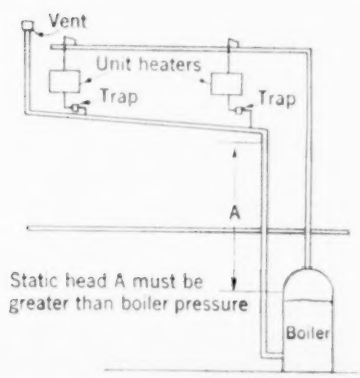


Fig. 1. Closed return systems with traps.

While this is somewhat beside the point, it is practical in some instances to use traps in connection with gravity return systems. If the static head of condensate between the lowest unit heater and the water level in the boiler is greater than the steam pressure carried in the boiler, each unit heater can be trapped and the traps can discharge to a condensate return header, that is vented at the high point. This can be an open vent, or it can be a thermostatically controlled vent. Condensate will build up in the return header until the static pressure is sufficient to force the condensate back into the boiler. The water level in the return header will never get as high as the trap connection from the lowest unit in the system. Such a system is shown in Fig. 1.

We have furnished quite a few Armstrong traps for draining unit heaters and individual greenhouse heating lines with a gravity return system. Unfortunately for us, the possibilities for using traps on such systems is definitely limited.

*T. H. Rea*
*Sales Manager*
*Armstrong Machine Works*
*Three Rivers, Mich.*

Whether a trap is required on a unit heater is dependent upon the type of heating system already in use or to be used. We know that because of the rather serious reduction in pressure in units, it is always advisable to put traps at the units and to connect them to the return line which goes back to either the receiver of a condensation pump, the receiver of a vacuum pump, or to a boiler return trap or an alternating receiver. See Fig. 2-1.

Occasionally, installations are made in which no traps are used and the type of system is a simple two-pipe gravity system. Sometimes, trouble develops with this type of system because of the drop in pressure occurring

### Problem for Coming Issue

**We have been having what we believe is an excessive amount of corrosion in our condensate return lines. Although water treatment of some kind is indicated, we are confused as to what treatment is available and what such treatment will do to the water. The water delivered to the plant has been treated by zeolite to soften the water so that it can be used for washing textiles.**

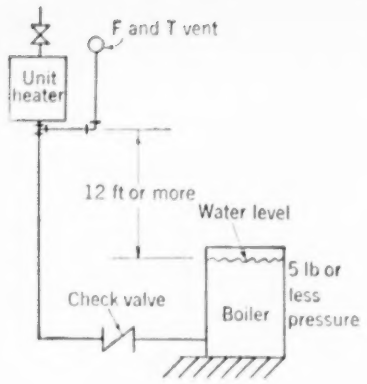


Fig. 2. Condensate flows back to boiler by gravity. No trap is placed at the unit heater.

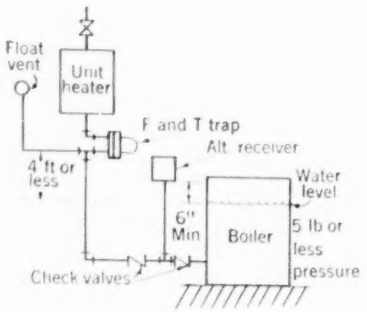


Fig. 3. Condensate flows from unit through F and T trap. Boiler return trap returns condensate against boiler pressure.

in the unit heater. Also, unit heaters must be furnished with separate float-thermostatic type air vents to relieve them of air because the returns do not provide a means of eliminating air from the system.

Sometimes, unit heaters may be sufficiently high above the water line of the boiler so that it is only necessary to vent the air returned through a float type air eliminator and then the condensation can be carried back into

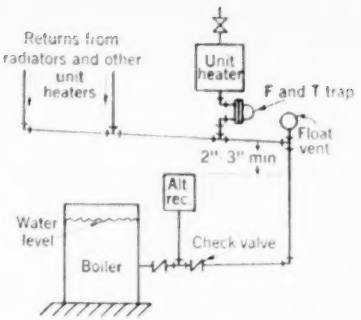


Fig. 4. Returns connected to the return line from other radiators and units having traps. Air is centrally vented and boiler return trap returns condensate to boiler.

the boiler without a pump or boiler return trap because the static head existing is sufficient to overcome whatever normal pressure there will be in the boiler, and no trap need be used at each unit heater. For instance, if the static head is about 12 ft, the boiler pressure could go to 5 psi and the condensation would still return without flooding the return lines. In most cases, however, returns from the unit heaters are connected into the return line only moderately higher than the water line in the boiler. Therefore, the static head to return the water without any outside assistance is not available. All of this means that a trap at each unit must be used, and the condensate returned to a pump or boiler return trap.

Illustrated are conditions under which traps are used and when they need not be used. Our recommendation is that traps always be used on unit heaters in conjunction with a two-pipe system of heating as we find the maintenance of a definate pressure in the boiler is one that cannot always be guaranteed, and often the boiler pressure will run higher than the normal expectation.

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## Study of Moisture Movement in Soils

As the result of a study conducted at Columbia University, New York, for the past three years to determine how and why moisture moves in granular media such as soils under a temperature difference, the following summations were made.

Heat pump coils buried in soil under certain conditions absorb up to 50 per cent more heat than would be anticipated from thermal transfer calculations.

Moisture movement in the soil may be the important factor in causing this difference.

This research was reported by W. A. Hadley, associate professor, Department of Mechanical Engineering, Columbia University and Raymond Eisenstadt, graduate student, at the semi-annual meeting of the American Society of Heating and Ventilating Engineers at Denver, Col.

By using a simulated soil, made of glass beads 0.01 inch diameter, adding a small amount of radioactive cobaltous nitrate to the water in the soil, and using a Geiger counter, it was possible to determine whether the moisture transfer under the influence of temperature was in liquid or vapor form. The most important conclusion reached by the authors is that a critical moisture content of about four percent separates liquid from vapor movement in the soil.

The information uncovered by this study is of threefold interest to heating and air conditioning engineers. This work bears a direct relationship to heat pump ground coils, to air conditioning in mines, and to an understanding of that Arctic soil condition called "permafrost."

With respect to heat pump ground coils, it is possible that a considerable amount of heat is carried directly to the ground coil by the water movement. There has also been some speculation as to the amount of moisture that might migrate into mine shafts due to the temperature gradient. On the basis of the present study this consideration can be largely eliminated because no appreciable moisture movement was found in the wet soils without freezing temperatures and the soils will rarely, if ever, be below the critical moisture content. Lastly, high moisture contents might characterize "permafrost" in soils above the critical while, if soils could be maintained below the critical no problem would exist.

# Flow and Fan—

## Principles of Moving Air through Ducts

C. HAROLD BERRY

Gordon McKay Professor of Mechanical Engineering, Harvard University

## Part 8. Effect of Variables on Fan Performance

**The influence of fan diameter and speed, gas density, and system resistance is discussed in this eighth of a 12-part series. Useful constants are developed and the fan laws stated.**

WE have remarked that the performance of a fan in terms of quantity, $Q$, and power, $P$, is controlled by four independent variables: fan size (wheel diameter, $D$), fan speed (rpm, $N$), gas density ($\rho$), and system resistance ($H_s$). We have studied the influence of system resistance and found that it yields unformulated relations commonly set forth by curves of $H$ and $P$ plotted against $Q$. We now proceed to study the influence of the variables $D$, $N$, $\rho$, fan size, fan speed, gas density. The fourth variable, $H_s$ we shall anchor for this study by considering the fan, or similar fans of the same series, operating at the same equivalent orifice, that is, at the same point of rating. If the fan size changes, so will the diameter of the equivalent orifice (or the dimensions of the duct system) in proportion to the diameter of the fan wheel. The size of the equivalent orifice is unaffected by the fan speed or the gas density.

So, at given equivalent orifice, we shall consider that the size of the fan, $D$, the speed, $N$, and the gas density, $\rho$, may assume any values, and we wish to find out how $Q$, $H$, and $P$ will vary. This we can do most readily by means of dimensional analysis.

Note that the pressure H developed by the fan must equal the system resistance $H_s$, which we have "anchored" to an equivalent orifice whose size will vary with fan size $D$. We could not assign a constant value to $H$ because that would entail invariable values of the very quantities that we propose to change. At the same time, we must eliminate from this step the influence of system resistance on $Q$ and $P$. We do this by freezing this influence in terms of the equivalent orifice which will have a diameter proportional to $D$.

### Dimensionless Constants for Fans

For similar fans (or the same fan) operating at the same equivalent orifice the quantity $Q$ and the power $P$ will depend upon fan size $D$, fan speed $N$, and gas density $\rho$. The flow through a fan is always in the turbulent region; viscosity is neglected. The form of dependence can be derived from dimensional analysis.

$$Q = k\, D^a N^b \rho^c \tag{182}$$

$$[L^3\ T^{-1}] = [L]^a\ [T^{-1}]^b\ [M\ L^{-3}]^c \tag{183}$$

$$\left.\begin{array}{ll} [M] & 0 = c \\ [L] & 3 = a - 3c \\ [T] & -1 = -b \end{array}\right\} \tag{184}$$

$$a = 3;\ b = 1;\ c = 0$$

Hence

$$Q = k\, D^3\, N \tag{185}$$

or, finally,

$$\frac{Q}{D^3\, N} = \text{constant (dimensionless)} \tag{186}$$

Repeating for the pressure developed, we must note that, whatever our practical units, $H$ is fundamentally force per unit area = mass x acceleration/area.

$$H = k\, D^a N^b \rho^c \tag{187}$$

$$[M\ L^{1}\ T^{-2}] = [L]^a\ [T^{-1}]^b\ [M\ L^{-3}]^c \tag{188}$$

$$\left.\begin{array}{ll} [M] & 1 = c \\ [L] & -1 = a - 3c \\ [T] & -2 = b \end{array}\right\} \tag{189}$$

$$a = 2;\ b = 2;\ c = 1$$

$$H = k\, D^2\, N^2\, \rho \tag{190}$$

$$\frac{H}{D^2\, N^2\, \rho} = \text{constant (dimensionless)} \tag{191}$$

And repeating again for the power required,

$$P = k\, D^a N^b \rho^c \tag{192}$$

$$[M\ L^2\ T^{-3}] = [L]^a\ [T^{-1}]^b\ [M\ L^{-3}]^c \tag{193}$$

$$\left.\begin{array}{ll} [M] & 1 = c \\ [L] & 2 = a - 3c \\ [T] & -3 = -b \end{array}\right\} \tag{194}$$

$$a = 5;\ b = 3;\ c = 1$$

$$P = k\, D^5\, N^3\, \rho \tag{195}$$

$$\frac{P}{D^5\, N^3\, \rho} = \text{constant (dimensionless)} \tag{196}$$

Thus we have three basic dimensionless constants that apply to all similar fans (or the same fan) operating at the same equivalent orifice:

$$\text{(a)}\ \frac{Q}{D^3\, N} = A \qquad \text{(b)}\ \frac{H}{D^2\, N^2\, \rho} = B \qquad \text{(c)}\ \frac{P}{D^5\, N^3\, \rho} = C$$

Since these are all dimensionless constants, we may combine them in various ways to secure new dimensionless constants. The combinations that follow will be useful in one way or another, as will soon appear.

$$\text{(d)}\quad \frac{A\,B}{C} = \frac{Q\,H}{P} = \text{constant}$$

$$\text{(e)}\quad \frac{A}{B} = \frac{Q\,N\,\rho}{H\,D} = \text{constant}$$

$$\text{(f)}\quad \frac{A^{1/2}}{B^{3/4}} = \frac{N\,Q^{1/2}\,\rho^{3/4}}{H^{3/4}} = \text{constant}$$

$$\text{(f')}\quad \frac{N\,Q^{1/2}}{H^{3/4}} = \text{constant for fixed density}$$

$$\text{(g)}\quad \frac{C^{1/2}}{B^{5/4}} = \frac{N\,P^{1/2}\,\rho^{3/4}}{H^{5/4}} = \text{constant}$$

$$\text{(g')}\quad \frac{N\,P^{1/2}}{H^{5/4}} = \text{constant for fixed density}$$

$$\text{(h)}\quad \frac{A^2}{B} = \frac{Q^2\,\rho}{H\,D^4} = \text{constant}$$

Many more combinations might be formed, if they gave promise of usefulness.

It may be pointed out that each of the foregoing combinations serves to eliminate something. (d) eliminates $D$, $N$, $\rho$, and therefore tells us something about similar fans irrespective of size, speed, or gas handled. (e) eliminates the exponents 2 and 3, and is useful in computing results. (f) and (g) eliminate fan size, and are useful in comparing performance data, as well as in computing results. (h) eliminates speed, and tells us something about similar fans running at unspecified speeds.

More detailed discussion of these constants follow.

## Equivalent Orifice—Corresponding Points

As has been noted, the constancy of the foregoing quantities for two fans requires that the fans be operating at the same equivalent orifice (diameter of which is proportional to the fan $D$), that is at corresponding points on their characteristic curves, or at the same point of rating. These various phrases have been used to express an idea that has been defined rather vaguely. Now we are in a position to give a much more precise definition of the idea, which it is hoped will also be clearer.

When two similar fans are operating under such circumstances that expressions (a) to (h) have the same value for both fans, the fans are said to be operating at the same equivalent orifice, or at corresponding points, or at the same point of rating.

It will be obvious that if one constant has the same value for both fans, so must all the others. Thus any one of the constants can be used to define corresponding points.

## Efficiency

We have seen in equations (161) and (163) that the air horsepower of a fan is $Q\,H/6350$ where $H$ is properly the rise in total pressure, alternatively the fan static pressure for the fictitious so-called static horsepower. The efficiency of a fan is the ratio of the air horsepower to the shaft horsepower $P$ measured during test.

$$E = \frac{Q\,H}{6350\,P} \qquad (197)$$

This differs from constant (d) only by the divisor 6350, therefore from the constancy of (d) we assert that for similar fans operating at corresponding points the efficiency will be the same. As will appear later, this is not borne out exactly in practice. There is a tendency for smaller fans, especially very small ones, to show lower efficiency. For wheel diameters over about 30 inches, however, the difference is not great.

We sometimes call this efficiency the mechanical efficiency to distinguish it from other little used ratios that are called efficiencies. Whenever the word efficiency is used without qualification, it is this power ratio that is meant.

*Volumetric efficiency*, an obsolescent term, is defined as the ratio of the gas discharged per revolution to the volume of the fan impeller (of diameter $D$ and width $w$).

$$E_v = \frac{Q}{\pi\,D^2\,w\,N} \qquad (198)$$

For similar fans, $w$ is proportional to $D$, and $D^2w$ is proportional to $D^3$, so that the constancy of (a) shows that for similar fans at corresponding points the volumetric efficiency is the same.

*Manometric Efficiency* is another obsolescent ratio, defined as the ratio of the pressure developed to the velocity pressure of gas moving at the tip speed (peripheral velocity $= \pi D\,N$) of the fan impeller.

$$E_m = \frac{H}{\frac{\rho(\pi D\,N)^2}{2g}} = \frac{2g}{\pi^2} \times \frac{H}{D^2\,N^2\,\rho} \qquad (199)$$

which involves the constant (b). Manometric efficiency is the same for similar fans at corresponding points.

It will be noted that neither the volumetric efficiency nor the manometric efficiency is properly called an efficiency, since neither is an energy ratio. They are quantities relating the dimensions and speed of the fan to its capacity or pressure respectively, and they are constant for similar fans running at corresponding operating points. There is no reason to suppose that a fan will discharge a volume of air equal to its wheel volume in any stated number of revolutions; actual values of the volumetric efficiency range from 100 percent to 400 or 500 percent, which merely means that some fans will, under some conditions, discharge a volume of air equal to their wheel volume in one-fifth of a revolution. Manometric efficiency likewise ranges from perhaps 30 percent to

150 percent; low values do not indicate inferiority nor high ones superiority.

## Specific Speed of Fan

If we equate two value of constant (f) one for any fan and one for a similar fan which at the corresponding point delivers unit Q against unit H, we have

$$\frac{NQ^{1/2}\ \rho^{3/4}}{H^{3/4}} = \frac{N_o 1^{1/2}\ \rho_o^{3/4}}{1^{3/4}} \qquad (200)$$

If we further specify that the two fans handle the same fluid, we find that the density factor cancels, leaving

$$(f') \qquad \frac{NQ^{1/2}}{H^{3/4}} = N_o \qquad (201)$$

that is, expression (f') for a fan operating at a given equivalent orifice equals the speed of a similar fan of appropriate size* which, when delivering the same gas through the same equivalent orifice, delivers unit quantity against unit resistance.

Expression (f') is called the *specific speed* of the fan operating at the given equivalent orifice, i.e., at a given point on the characteristic curve. It is sometimes called the characteristic speed.

Whether (f) or (f') should be called specific speed is a question not to be discussed here. Suffice it to remark that (f) is dimensionless and that with the omission of the density factor it loses generality and also becomes dimensional, but (f') does not have the dimensions of speed, unless we regard the two unit integers in equation (200) as being dimensional, a device that is a trifle artificial.

For centrifugal pumps an expression resembling (f') has been used for a long time, but it is a different quantity. Here we have used the symbol *H* to denote the *pressure* developed. In pump practice, *H* denotes the *head* developed. Head is equal to pressure divided by specific weight, that is, pressure divided by density in pounds (not slugs). Expression (f) includes this ratio, and if *H* in (f') is considered to denote *head* and in (f) to denote *pressure* the two expressions become identical. The hydraulic expression can be shown to be dimensionless if it is recalled that specific weight or heaviness (density in pounds) equals the density (in slugs) multiplied by the acceleration of gravity. Omission of this factor (g) does not affect the constancy of the numbers, but it does spoil their dimensionlessness.

Expression (f), in which the density appears, and in which *H* denotes the *pressure* developed, provides a sound basis for comparing the performance of fans and centrifugal pumps handling all manner of fluids. It would be interesting to explore this suggestion.

We shall wish to use the constant (f) later in this discussion, and to distinguish it from (f'). Since (f') is usually called the specific speed, let us call (f) the *generalized specific speed*. The reader is warned that this is a term invented for this discussion and presumably not to be found elsewhere.

Specific speed (f'), it should be noted, is a constant, not for a given fan, but for a given fan operating at a given equivalent orifice (a given point on its characteristic curve) while handling a gas of given density. If the gas density changes, the pressure developed (*H* in pressure units, such as psf) varies as the gas density. Equation (167) and equation (131) establish this mode of variation for the system or orifice of fixed size, and constant (b) establishes it for the fan. Accordingly, for a given fan, running at a given equivalent orifice, the specific speed (f') varies with the gas density.

The generalized specific speed (f) on the other hand, is independent of the gas density. Both *H* and $\rho$ appear in the expression with the same exponent, which is merely another assertion that other things being constant, the pressure developed is proportional to the gas density. For a given fan operating at a given equivalent orifice, the generalized specific speed (f) is constant regardless of the actual fan speed or the actual gas density.

Thus the specific speed (f') is characteristic of the fan together with the gas it handles, whereas the generalized specific speed (f) is characteristic of the fan alone. For both quantities, of course, the fan is supposed to be operating at a given equivalent orifice.

For a given fan, as the representative point moves along the characteristic curve, the specific speed (both f and f' since for a given curve the density is constant) varies from zero at shut-off (where Q = 0) to infinity at wide open if H is the fan static pressure (zero at wide open) or to a maximum value if H is the total pressure developed by the fan.

*The specific speed of a fan* (as of a centrifugal pump) is the value of (f') computed for the point at which the fan is rated or operated. This is definite, but the numerical value of (f') depends upon the units used (even though they may be consistent units) because (f') is not dimensionless. If expression (f) were used, any consistent system of units would yield the same numerical value, which might be a more satisfactory situation.

Specific speed is (perhaps unfortunately) little used for fans. For centrifugal pumps it is widely used as a basis for comparing performance. For example, if efficiency be plotted against specific speed, the points for a wide variety of pumps will define a reasonably definite band that serves as a fair guide in choosing a pump for a given duty.

## Specific Speed of a Water Wheel

If we examine the constant (g) we note that, save for the density factor, it is the speed of a similar machine which, at the same point of rating, develops unit power with unit pressure or head. The quantity (g') is the specific speed, as commonly defined for a water wheel with *H* denoting *head*. It is the speed of a similar wheel which develops unit power under unit *head*. Almost all that we have said concerning (f) and (f') might be repeated for (g) and (g').

*Constant (e) shows us that the size of this "unit" fan is $D_o = D_1 H_1^{1/4}/Q_1^{1/2}$ if gas of the same density is handled by the working fan and by the "unit" fan. Evidently the "unit" fan is very small. This is not important, but may be mildly interesting. For example, a fan whose performance we shall shortly consider has a wheel diameter of 36 inches and may operate at H = 2 inches of water, Q = 41,000 cfm. For this point the diameter of the "unit" fan is $D_o$ = 0.211 inch.

The constant (h) eliminates speed, and relates similar fans (or the same fan) operating at corresponding points, each running at the speed necessary to meet whatever specifications we set up. It is interesting to compare this with the constant quantities worked out in equation (167) for the system, and in equation (181) for the equivalent orifice. These latter, of course, do not involve speed, and give identical relations. Thus if $Q$ and $\rho$ are held constant, $H$ will vary inversely as $D^4$, where $D$ is the diameter of the fan wheel, or the typical dimension of the duct system or the diameter of the equivalent orifice. All of these dimensions must be proportional, so that we are merely saying again that the fan and a *similar* system and an orifice all behave consistently. Again, if $\rho$ and $D$ are constant, i.e., if we consider the same fan handling the same gas, but running at any speed, $H$ is proportional to $Q^2$ for the fan, for the system, and for the equivalent orifice.

We might multiply examples of this sort almost endlessly, using any of the constants we have developed, or any of the many others that might be worked out if they gave promise of usefulness. Thus we can establish comparisons between any two similar fans at the same equivalent orifice, for any chosen set of fixed quantities, with the result expressed in a relation between any two quantities that are variable.

*Dimensionlessness* demands that consistent units be used in substituting values in any of the foregoing expressions. One set of consistent units is:

volume in cubic feet per second
pressure in pounds per square foot
power in foot-pounds per second
diameter in feet
speed in revolutions per second
density in slugs (lb/g) per cubic foot

These units are not those in common engineering use. If we wish to use the common units, we must introduce conversion factors, e.g.,

cfm/60 = cfs
inches water × 5.19 = psf
horsepower × 550 = ft-lb/sec
inches/12 = feet
rpm/60 = rps
lb per cu ft/32.174 = slugs/cu ft

If we were to follow strictly the dictates of dimensional analysis, we should have to insert these conversion factors (or others like them) whenever we compute one of the constants. Better still, we should use the factors beforehand to reduce all of our measurements to consistent units, and substitute the resulting numbers in the various expressions.

This, however, is not necessary for the purpose for which we usually use these constants. In every application (with few exceptions) we wish merely to equate the values of one or more of these constants for one fan operating under given circumstances to the respective values for a similar fan (or the same fan) operating under different circumstances. In any such equation the unit conversion factors would appear in both members in the same way, whereupon all the factors would cancel out. So, in practice, we use whatever units are convenient. This in no way affects the constancy of these expressions, and therefore does not impair their usefulness for most purposes. It does, however, make it a little difficult to check the dimensional situation. If it is desired to check dimensions, it will be more convenient to work with a strictly consistent system of units.

Mention has been made of possible exceptions to the use of any convenient units in these expressions. A single example will suffice. In computing the specific speed as a basis for comparing the performance of diverse machines, it will be necessary to use like units for all cases, and this can perhaps be done most easily by adopting a consistent system. For example, the specific speed for a centrifugal pump is often computed for $N$ in rpm, $Q$ in gallons per minute, $H$ in feet of water, and density (for the generalized specific speed) as unity (specific gravity). On the other hand, for a fan we might use cfm, inches water, and pounds per cu ft. If the values were to be used to compare the pump and the fan, the results would of course be unintelligible. In such cases we must obviously use like units, and a consistent system is to be preferred.

## The Fan Laws

In the fan business, as we have remarked, a given design of fan is made in various sizes. One fan of a series is tested at some convenient speed, handling gas of a convenient density. From the characteristic curves developed by test of this chosen fan, we can compute the performance of any other fan of the same series, running at any speed, handling a gas of any density. We may do this by evaluating the dimensionless constants developed previously, but it is customary in practice to state the relations in somewhat different terms, in the so-called Fan Laws.

### *The 1-2-3 Law*

For the same fan, handling the same gas ($D$ and $\rho$ constant, $N$ varying):

$Q$ is proportional to speed, $N^1$
$H$ is proportional to speed squared, $N^2$
$P$ is proportional to speed cubed, $N^3$
$E$ is the same.

### *The Density Law*

For the same fan, operating at the same speed, handling different gases ($D$ and $N$ constant, $\rho$ different):

$Q$ is the same
$H$ (in pressure units) is proportional to density
$H/\rho$ (head in feet of fluid) is the same*
$P$ is proportional to density
$E$ is the same.

### *Similar Fan Law*

Similar fans operating at the same tip speed, handling the same gas ($\rho$ and the product $DN$ are constant):

$Q$ is proportional to $D^2$
$H$ (in pressure units) is the same.
$P$ is proportional to $D^2$
$E$ is the same.

These three fan laws are readily remembered, and many engineers use them for the expeditious conversion of fan performance.

*This relation shows why a centrifugal pump is not self-priming. A pump handling water will develop, let us say, a head of 300 ft of water. If the same pump is run at the same speed with air, it will develop a *head* of 300 ft of air. But this corresponds to a *pressure* of only a little over four inches of water, which is insufficient to "lift" water to the pump.

*The fan and its relation to the system as a whole will be taken up in Part 9 next month.*

# Reducing Customers' Steam Demand

CARL B. SPRENGER

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From a group of papers presented by the Commercial Relations Committee of the National District Heating Association before the association's annual meeting at Chattanoga, Tenn.

REDUCING a heating system's steam demand may be most practically accomplished by reducing the maximum hourly steam consumptions of the large customers during a few hours only, on several cold days in the winter. To supply a high steam demand for a relatively few hours per year, our companies are forced to maintain an excessive boiler and steam main capacity. If this reduction could be accomplished, it would mean that we could add new customers without an increase in boiler or steam main capacity. These are items of interest to all when boiler capacity costs $6 per pound and street mains cost from a low of $50 to $125 per foot installed.

To get the opinion of a number of companies, a questionnaire was sent out asking if a demand rate was used, what type of customers were on the rate, and similar questions. Out of ten replies, five indicated that they had demand rates and one indicated that a demand rate was the only rate they had.

For their billing demand, several companies use the average of the three highest hourly demands and others use the maximum hour.

All the companies reached through a questionnaire were interested in the subject of reducing the demand, but many did not seem to have had any experience along that line. This may be explained by the fact that they did not have a demand rate and never actually metered the customers' hourly consumption.

The problem of reducing customer demand applies to all customers and not just to those on a demand rate. There are a number of tried and tested ways, some of which follow, for reducing this demand.

## Heating Controls

Install controls on the heating system so that a constant temperature may be maintained in the building during the hours of use. If the building is large, it may be well to divide the heating system into zones. If this is done, the morning warm-up periods of the zones may be staggered in such a manner as to keep the hourly steam demand at a minimum.

In the case of a building where zoning would not be practical and a single control is installed, the demand could be kept at a minimum by increasing the temperature gradually. Instead of using a two-hour warm-up in the morning, extend it to about five or possibly six hours.

Another means of reducing the warm-up demand is to maintain normal or near normal temperatures through the night hours during the coldest portions or periods of the winter.

## Stagger Use of Process Steam

Stagger the use of process steam during the daytime hours. We have several demand customers, each of whom has a laundry and, in order to reduce hourly demand, they do their washing after 6 p. m. for the three months during which the demand is metered. A laundry can also heat up its equipment, flat work ironers and presses, during off-peak hours. In clubs, swimming pools can be heated after midnight when the other process requirements are low.

## Other Means

There are still other means for achieving a reduction in customer demand, as follows:

(1) Limit ventilation to minimum requirements. Do not operate a unit with capacity for 2,000 people when there are only 200 in the space to use the facilities. Heat ballrooms and auditoriums that are not regularly used during the off-peak periods so they will be ready for occupancy when needed.

(2) Install thermostatic controls on roof tank heaters because steam is not required when the outdoor temperature is above 32F or if the water temperature in the tank is above 40F.

(2) Keep all heating equipment in first class condition. This applies to steam and return lines, traps, pumps, and controls.

(4) In a vacuum system, maintain the proper vacuum and pressure.

(5) Do not overheat the whole building to correct some local condition which is causing a no-heat complaint.

(6) Use the condensate in an economizer to preheat the domestic hot water.

(7) Keep daily, or better yet, hourly, consumption records and check against the theoretical requirements.

(8) Study the system and understand its function and operation.

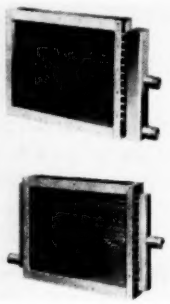
(9) Do not waste heat.

# NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite page 135 for securing additional information on items described in this department.

## Heating Coils in 3 Types

Improved heat transfer surface and structural design are incorporated in a new heating coil line, introduced by Young Radiator Co., Racine, Wis.



The new line consists of three types. Type S, standard model, is designed for steam or hot water service; Type HD, heavy-duty, is for severe industrial applications, and Type SD, steam distributing coil, is for steam systems when system performance is regulated by modulating the steam supply to the coils.

Type S heating coils are available in 11 nominal widths, Types SD and HD are available in 5 nominal widths; all types in 19 lengths from 12 to 120 inches.

Features include corrosion resistant red brass tubes; headers formed from heavy-gage, 3/16 inch hot-rolled steel; galvanized steel casing with double channel top and bottom, provide support and protection for core; tubes mechanically expanded into fin collar to form a double-walled, continuous metal transfer surface; and cross-angles welded to the tube support and coil casing, to provide permanent reinforcement for entire coil structure.

More Information? Circle Item 1 on postcard, page 135

## Compressible Flexible Hose

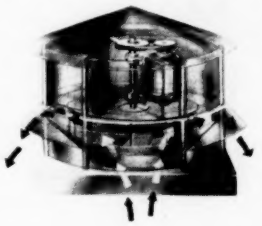
A new, inexpensive, easily handled, flexible hose is introduced by American Ventilating Hose Co., New York, N. Y., under the trade name Portovent. This new product is for fume exhaust and ventilation applications and has unusual lengthwise compressibility. It has excellent air flow characteristics and maintains a large cross section even on sharp bends. It is easy to install, transport, handle and store.

The hose is made from cotton or nylon fabrics, impregnated with Neoprene compound and spiral wire reinforced. It can be supplied in sizes from 4 to 36 inches inside diameter and is available in any desired length. It can be easily cut to size in the field with no weakening or raveling since it is bonded and not stitched.

More Information? Circle Item 2 on postcard, page 135

## High Static Roof Exhauster

A belt-driven power roof exhauster is announced by The Gallaher Co., Omaha, Neb. The new units bring the power roof exhauster into competition with conventional vent sets which have controlled most ventilation problems which demand high static pressures and large volumes of air. The units which have the economic advantages of self contained power exhauster, installation without penthouses and extra ductwork. They will develop up to 4 inches static pressure and up to 65,000 cfm.



This brings most industrial ventilation processes where high slot velocities are required well within the range of this new unit. According to the company, the secret of this high performance is based on seven years of research and development of the company's scroll effect for centrifugal power roof exhausters. The company's research indicates that unless scroll effect is present, efficient performance of a power roof exhauster against even moderate static pressure is impossible.

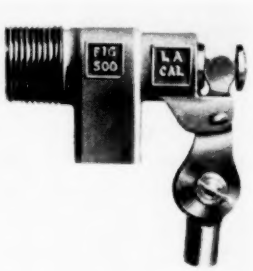
The unit also features an air seal-off which develops a negative air pressure around the motor shaft and prevents explosive or corrosive fumes from entering the motor housing.

Other features are weather proof umbrella-type outlet, heavy construction and all welded, balanced backwardly curved centrifugal fan wheels.

More Information? Circle Item 3 on postcard, page 135

## Positive-Action Float Valve

Fig. 500, a new, rugged, compact, all-brass constructed float valve, is introduced as a companion to its Fig. 400 by Robert Mfg. Co., Los Angeles, Calif. It is available individually or in complete assemblies.



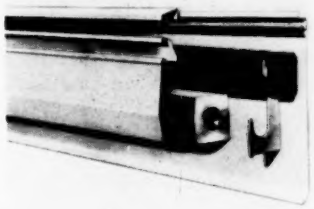

The valve is for standard duty applications on cooling towers, condensate systems, process equipment, tanks, coolers and other industrial equipment of all sorts requiring accurate control of fluid level. These valves are available equipped with special discs for various services for which standard disc materials would be unsatisfactory.

These new valves will not chatter, leak or drip and are precision machined of best quality materials. A ratchet arrangement of actuating lever permits quick, positive adjustment to any desired fluid level. They are threaded for sizes ½ and ¾ inch IPS.

More Information? Circle Item 4 on postcard, page 135

## Baseboard Heating Panels

A new line of baseboard heating panels is available from Tuttle & Bailey, Inc., New Britain, Conn. The panels are streamlined in appearance and, when installed in place of conventional baseboard, are inconspicuous, save valuable floor space. Finished in prime coat, panels may be painted to match wall or trim.



The panels are ideally suited to the installation of perimeter heating which blankets cold outside walls and glass areas with warm air. Cool room air enters at the base of the panel, is heated as it passes through the fins of the element, and re-enters the room through the opening at the top of the panel.

Design features include one-piece front and back panels which facilitate installation. The heating element consists of 1 inch copper tubing which is expanded to hold fins securely in place. Accessory equipment includes a lever-operated damper, outside corners, end caps, and joiner strips. All accessories are installed without the use of tools.

Two types are available, Type BR for recessed installation and Type BF for free standing installation. Both types are available in 5 ft. and 6 ft. lengths, and are conveniently packaged as complete units.

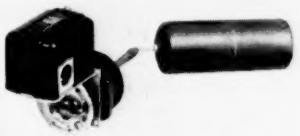
Catalog No. 301 is available.

More Information? Circle Item 5 on postcard, page 135

## Condensate Pump Float Switch

A screw-in tank float switch for condensate pumps has been designed by Square D Co., Industrial Controller Div., Milwaukee, Wis. It provides automatic control of the liquid level within closed tanks.

The flexibility of the switch reduces the stocking problem to a minimum. The float position can be changed from right to left hand side or vice versa. Contacts may be converted to either open or close on liquid rise.



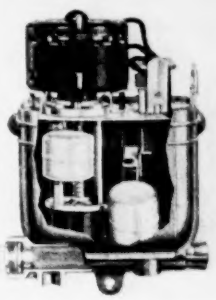
Without removing the switch from an installation, float travel may be adjusted in the field, within limits, by loosening two screws and moving the float stops to the desired position. A float position indicator and indicating dial aid in obtaining proper settings. The switch will function properly under a pressure of 50 psi.

The modern overall appearance of the Class 9037 Type HG is styled consistent with the streamline design now being adopted in the pump industry. Switches are available for 110-220 volts and 440-550 volts. Watertight seal is insured by a graphite-coated asbestos, used in the stuffing box.

More Information? Circle Item 6 on postcard, page 135

## Assures Constant Oil Supply

Redesigned to incorporate a number of improvements developed to increase operating efficiency and convenience, a new Model 346 Oilifter is announced by A-P Controls Corp., Milwaukee, Wis. It converts any oil-burning appliance using a vaporizing burner, such as a space heater, furnace, range or water heater, to completely automatic operation. It eliminates the necessity for filling the appliance tank manually, because the device will provide a constant supply of oil from an outside tank, or from a tank located in the basement. It will lift oil from a basement tank to a heater or other device located on the third floor of a building.



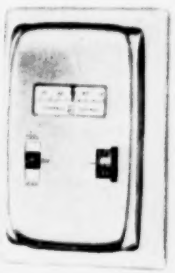
A number of safety features are incorporated. An extra safety float acts as a check on the normal operating float, and eliminates danger of overflowing of oil from the pump chamber. If the main oil tank should become empty, or if a leak should develop in the oil line to the burner, an automatic safety switch shuts off the Oilifter motor, preventing danger of the pump running while not pumping.

The unit may be used for vaporizing oil burners, rotary oil burners, many gun-type burners, conversion oil burners, space heaters, ranges and water heaters, or for any system requiring an oil-lifting capacity up to 4 gallons per hour at 15-foot lift, or 3 gallons per hour at 25-foot lift.

More Information? Circle Item 7 on postcard, page 135

## Year-Round Thermostat

A new two-way thermostat for the dual purpose of controlling air conditioned temperatures in summer as well as warmth in winter is introduced by General Controls Co., Glendale, Calif.



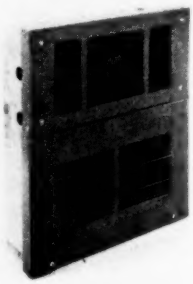
The new T-70H thermostat, almost identical in room appearance with the company's flush-design winter weather thermostat, has a three-position switch with Off, Heat, and Cool settings. In cold weather, the Heat position regulates furnace output just as a conventional thermostat. In hot weather, the Cool position and the temperature regulating dial signal room temperatures to air conditioning controls in the new combined units.

In addition to eliminating the need for separate thermostats, wired individually to furnace and air conditioner, the control reduces installation costs with a four-wire, low-voltage thermostat cable which connects with both heating and cooling controls in the new year-round air-comfort units.

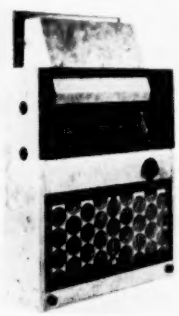
More Information? Circle Item 8 on postcard, page 135

## Conditioning with Split System

A complete split system which provides forced hot water heating in winter and air conditioning in the summer, and which places the radiator heat contractor in a stronger competitive situation in air conditioning than heretofore, is introduced by Hydraline Products, Borg-Warner Corp., Kalamazoo, Mich. The system is available for commercial and industrial applications as well as for houses.



Hot water in winter and chilled water in summer are piped to compact room units available in two types—a fully-recessed unit which fits between the joists in the wall (top photo), and a floor unit. These units contain a fin-a-tube heat exchanger, blower, filter and grilles, so that as the room air circulates through the unit it is heated or cooled and cleaned. Boilers and water chillers and accessories are available, or well or lake water, available in the summer in some localities, can be used.



Basic units for either wall or floor installation measure 17¾ x 14 x 4¾ inches. Domestic units have a heating capacity of 7200 Btu per hour each using 180F water and 3750 Btu per cooling capacity each with 40F inlet water flowing at 1.5 gpm.

The conditioner can also be adapted to dual wall application with a stack head from the top of the unit (center photo) to a register on the wall of an adjoining room. The stack can be carried up for a high wall outlet or carried through to heat second floor rooms. There is a capped opening in each basic conditioner for these various applications, and 40% of the total capacity can be directed through this opening. The distribution balance can be controlled by means of an adjustable damper in the unit for such applications.

Several control systems are recommended, the first of which is the single zone which consists of a central heating thermostat which controls the operation of the booster intermittently with boiler water temperature being maintained with conventional aquastat control. Fan operation is automatic by aquastat control within each unit. On the cooling cycle a thermostat of the low voltage type operating through relays controls the booster and chiller starter in parallel circuit. Besides the central automatic control system, the rate of air supply at each individual unit may be adjusted manually.

An advantage of the split system is that the air supply at the register can be individually controlled to exactly balance the requirements of individual rooms after the installation is made. Another advantage of the unit conditioning system is that air filtering is done at the return air register in each room rather than at a central point. Filters may easily be vacuum-cleaned (bottom photo) while cleaning rugs. They may be removed for cleaning or replaced simply by raising the return air register.

More Information? Circle Item 9 on postcard, page 135

## Railway Heating Control

A new heating control system for railway passenger cars, applying electronic controls to existing steam systems, has been developed by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The new system is designed especially for modernization of steam heating on existing passenger cars.

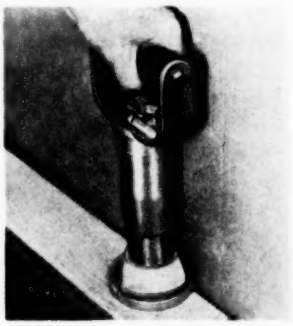
Installation of the system involves a modification of the steam system to obtain improved heat distribution. This modification is accomplished by using an arrangement of accurately spaced steam jets. Electronic controls used on the new system are identical with those employed in the company's standard liquid heating system. These include electronic thermostats, a control panel, modulating steam valve and a pressure reducing valve.

The company's new engine control is a high-pressure thermostat that works directly from the air supply on the locomotive without requiring a pressure-reducing valve. The thermostat, in turn, operates a single-piston motor to position radiator shutters.

More Information? Circle Item 10 on postcard, page 135

## Shield for Powder Tool

A new design feature of the Velocity-Power Driver, cartridge-actuated tool for setting studs in concrete or steel, is a permanently attached spall or protective shield, it is announced by Velocity Power Tool Co., Pittsburgh, Pa. For close-to-the-wall jobs a section of the spall shield may be lifted and turned out of the way. The company will continue to offer a model of the driver with separate spall shield.

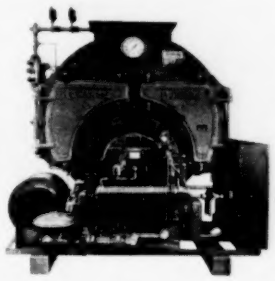


The tool is used on both new construction and maintenance jobs in heating, plumbing and air conditioning installations, saving time, labor and money because it enables the user to set a stud within seconds. The worker simply loads, positions and fires it and the job is done. Use of an integral cartridge eliminates the need for matching and fitting. Interchangeable barrels permit driving of either ¼ or ⅜-in studs with the same firing unit. Studs available are either solid head, or internal or external-threaded. A spring-loaded safety arm and center-fire cartridges avoid accidental discharge, and assure the correct load for the job.

More Information? Circle Item 11 on postcard, page 135

## Integrated Boiler-Burner Unit

The Kewanee-Ray boiler-burner unit for high and low pressure steam and hot water heating, is jointly announced by Kewanee-Ross Corp., Kewanee, Ill., and Ray Oil Burner Co., San Francisco, Calif. The unit is being manufactured for high pressure steam to produce 39 to 456 certified output horsepower at 125 and 150 lb wp and for low pressure 15 lb steam or 30 lb water in sizes to produce 1,313,000 to 15,300,000 Btu hourly. Certified tests substantiate top efficiencies in all firing ranges with the heavy catalytic residual fuel oils, as well as with light oils and high or low pressure gas.



The unit is designed for forced draft operation with a new multi-stage secondary air control on the burner providing a constant velocity type air stream, to the combustion zone, with a high turbulence, high turn down ratio and a high $CO_2$ content resulting in high combustion efficiency.

The boiler, complete with controls, piping and accessories, is assembled and shipped from the Kewanee plant. The burner with its built-in forced draft, fan and windbox controls and accessories, arrives in a separate shipment from the Ray factory. Because of its size, the boiler should generally arrive on the building site before the walls are up. Its construction is such that exposure to weather for considerable periods of time causes no damage. On the other hand, the intricate mechanism of the burner and its controls is such that it should not be delivered to the building until after walls are up to assure adequate protection. Both boiler and burner shipments can be timed to arrive when wanted.

More Information? Circle Item 12 on postcard, page 135

## Propeller Fans, 12 to 48 In.

A line of venturi type steel inlet orifice propeller fans is introduced by The Bishop & Babcock Mfg. Co., Cleveland, Ohio. Direct drive propeller fans are offered in 6 sizes from 12 to 30 inch wheel diameters, motors specified in all standard currents and voltages that result in 13 different combinations assuring a wide selection.

Motors have internal thrust bearings to absorb thrust. Direct drive propeller fans are available for both horizontal and vertical installation in 5 sizes from 24 to 48 inch wheel diameters and in 11 combinations.

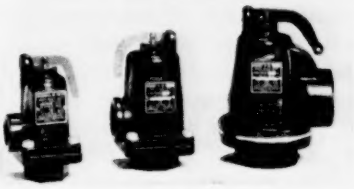
Fan wheels are deep pitch, quiet operating pressure type. Fan panels are constructed of heavy gage sheet steel with venturi type orifice. Motor and bearing mountings are assembled between heavy steel tubular brackets, which are welded to steel panel.

A complete line of accessories consisting of shutters and fan houses are obtainable. Bulletin 117 is available.

More Information? Circle Item 13 on postcard, page 135

## Large Pressure Relief Valves

Two new larger size pressure relief valves, for use on hot water space heating boilers to protect against over pressure, have been announced by McDonnell & Miller, Inc., Chicago, Ill.



These two new valves are larger versions of the company's ¾ inch No. 230 pressure relief valve (left), and are cataloged as the 1-inch No. 230 (center) and the 1½-inch No. 230 (right). They were developed to make time-tested pressure protection available at moderate cost for hot water boilers with heat output to 743,400 Btu per hr and 1,025,100 Btu per hr, respectively. The original ¾-inch No. 230 has a capacity of 303,000 Btu per hr. All valves are designed to open at 30 lb pressure.

The new valves comply fully with the ASME Boiler Code and have been tested, and ratings certified, by the National Board of Boiler and Pressure Vessel Inspectors. The symbols of compliance, and the certified rating, appear on each nameplate.

All operating parts of the new valves are of non-corrosive materials. The valve seat proper, or orifice, is of brass. High temperature silicone is used for the valve disc.

More Information? Circle Item 14 on postcard, page 135

## One Coat Aluminum Paint

A new aluminum paint requiring no prime coat has been added to its line of paint products, by Joseph Dixon Crucible Co., Jersey City, N. J. Known as Dixon One Coat Aluminum Paint, it features a built-in rust inhibitor.

More Information? Circle Item 15 on postcard, page 135

## Marks Pipe for Cutting

A tool for quick, precise laying out of pipe joints is announced by Contour Marker Corp., Compton, Calif. With this marker it is claimed that the average pipe joint can be marked for cutting in less than five minutes.

An articulated arm with soapstone point and a dial marked in both degrees and pitch are mounted on a base which is curved to rest on pipe. When the dial is set to the desired angle the jointed arm traces the cutting line around the pipe.

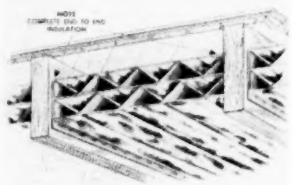
The device is intended to speed up pipe layout and to prevent the waste of man hours and cutting gas which occur with old fashioned cut and try methods. Instructions for making joints of various angles are included with each instrument.

Two models are available: Standard, for pipe ranging from 1½ to 18 inches in diameter, and Jumbo, for 16 to 48 inch pipe.

More Information? Circle Item 16 on postcard, page 135

## Improved Aluminum Insulation

Complete insulation coverage between studs and joists is the feature of a multiple accordion aluminum developed by Infra Insulation, Inc., New York, N. Y. This multi-layered blanket of aluminum, fiber and air spaces, has been made to be of uniform depth throughout, including the area immediately adjacent to the beam or joist.



With a reflectivity of heat rays of 97% and an emissivity of only 3%, multiple accordion aluminum is obviously effective against radiation. Its low mass, and the air-cells in it, keep down conduction flow to not much more than in an empty air space. The compartmentation blocks outer and inner convection. Multiple accordion aluminum is practically non-condensation forming. Its tough aluminum sheets interpose an impervious barrier to water vapor or to any other gas, including warm or cold air.

The new insulation retains all the advantages of the previous form of multiple accordion aluminum and in addition reduces heat transfer at the ends of the insulation adjacent to the joists. Commercially, it is available as Infra Insulation Type 6-Si (with three aluminum sheets) and Type 4-Si (with two aluminum sheets). Type 4-S Jr., which is made to fit spaces which are less than 2 inches deep, is also available.

Cost of the new insulation as installed in new construction between wood joists, material and labor both included, should be less than 9½ cents a square foot for type 6-Si. For Type 4-Si and 4-S Jr., it should be less than 7½ cents a square foot.

Samples of the insulation are available.

More Information? Circle Item 17 on postcard, page 135

## Water Tube Gas Boiler

The Gordoneer line of hot water cast iron wet base gas boilers, with self-cleaning water tube construction, is announced by Roberts-Gordon Appliance Corp., Buffalo, N. Y. The wet base construction allows for installation directly on combustible flooring and also permits all-on-one floor piping systems to be used, making these boilers suited for small homes, individual apartments, basementless homes, or small commercial buildings where space is at a premium.

The water tubes and baffles are cast in each section, a principle that provides maximum surface with intimate flue gas travel.

The burner is the company's Spreader-Flame. The boiler is approved by the AGA laboratories to be installed on combustible flooring.

The boiler is offered in three sizes: 87,000, 115,000 and 150,000 Btu input per hour supplying 315,460 and 600 square feet of standing radiation, respectively. It can be supplied with flush jacket finished in two-tone white and hammerloid grey baked enamel or with modern, fully enclosed extended cover in white.

More Information? Circle Item 18 on postcard, page 135

## Continuous Flame Burner

A gas-fired retention-type line burner for applications where heat must be distributed over a wide area by a continuous flame is a new product of Eclipse Fuel Engineering Co., Rockford, Ill. The new burner is said to be excellent for oven, kettle, and air heating installations, including make up air systems for spray booths.

The burners are of the blast burner design, which insures good combustion with rich neutral or lean mixture

at all mixture pressures. The burners may be installed to fire in any direction—horizontally, vertically or downward. They are made of cast iron sections with drilled ports and steel retention lips for flame stability.

Each section is equipped with drilled and matched flanges, so that they can be easily bolted together for a wide variety of continuous flame patterns. An adapter flange is available for applying either a blast or atmospheric pilot and flame failure protective equipment.

More Information? Circle Item 19 on postcard, page 135

## Low Temperature Dehumidifiers

To meet the increasing demands of industrial processors for continuous production in operations involving the use of air at sub-freezing temperatures, the Kathabar Div., Surface Combustion Corp., Toledo, Ohio, has extended its line of low temperature units to handle up to 17,000 cfm in individual units.

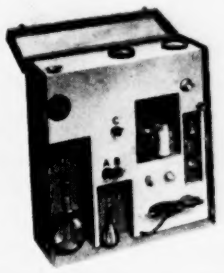
Requirements for air at sub-freezing temperatures, down to —100F, are found in the confectionery, pharmaceutical, brewery, aircraft, meat, plastic, food and other industries. Previous to the development of these units, air at these low temperatures could only be supplied with straight refrigeration equipment subject to periodic shutdown for defrosting. The efficiency of those operations was also impaired because of the insulating effect and air throttling action of frost formation.

These Kathbar units will also deliver air at 25 to 30F lower dewpoint than the dry bulb temperature of the air. In many cases this characteristic eliminates the necessity of cooling the air to the required dewpoint temperature. Since the dewpoint may be 25 to 30F lower than the dry bulb temperature required, substantial refrigeration savings are afforded.

More Information? Circle Item 20 on postcard, page 135

## Odor Intensity Meter

The Osmometer, an instrument for evaluating the intensities of odors, is being marketed by Odor Instruments Inc., New York, N. Y. The device is portable, made of pyrex glass parts and odorless plastics enclosed in a light aluminum case. By its use the technicians using the same specimen can obtain results whose readings never vary more than 4 or 5%, and it is said to be the only instrument built for the measurement of the intensity of odors.

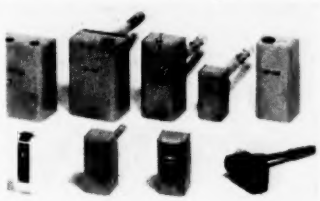


Operation of the instrument is based on the air dilution principle using quantities of odor-free air with the odorous air which are mixed in various concentrations.

More Information? Circle Item 21 on postcard, page 135

## Simplified House Heat Controls

A new line of simplified home heating controls for all makes of domestic oil burners is announced by General Electric Co., Appliance Control Dept., Schenectady, N. Y.



The line includes nine devices: a room thermostat, master control with bimetallic helix, flame detector and companion master control, transformer relay, fan and limit control, temperature limit control, water immersion temperature control, and a steam pressure control.

All are designed for fast, easy installation and fewer service call-backs. They may be mounted in any position without leveling, and feature easily-removable covers.

The room thermostat, which can be calibrated without tools, has a comfort dial allowing home owners to adjust the time cycle to home heating conditions. It can be converted to an automatic day-night thermostat by adding an ordinary radio resistor and time-switch clock.

The stack-mounted master control with bimetallic helix requires no adjustments, leveling, or call-backs after installation.

In case of flame failures, oil burners can be shut off in four to seven seconds by the new flame detector which has a nichrome-and-quartz detector rod sensitive to 30F temperature changes.

Companion to the flame detector is the master control, mountable on the side of the furnace or on the gun burner. Factory calibrated, the control needs no adjustment or leveling and has a recycling feature for temporary flame failures.

The transformer relay, a two-purpose control, operates a line-voltage load, such as a motor, from a low-voltage thermostat or other control. It can be used in oil burners, water circulators, unit heater fans, and cooling system condensing units.

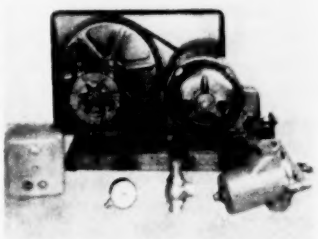
The water immersion temperature control for hot water systems features a dry well which helps protect the helix. The entire control, including the helix, can be removed from or placed into the dry well without tools. An adjustment setting slot protrudes through the cover and can be turned with a coin.

The steam pressure control is available for standard male and female compression fittings in any range of pressures and for various types of steam operation. Adjustments for range and differential are made by turning acorn nuts. The control needs no leveling.

More Information? Circle Item 22 on postcard, page 135

## Fuel Oil Pump Sets

Four models of York-Power fuel oil pump sets for use with industrial oil burners are announced by Industrial Div., York-Shipley, Inc., York, Pa. These pump sets are for use with non-pump type burners and especially in installations where more than one burner is involved or where an auxiliary method of oil transportation is required.



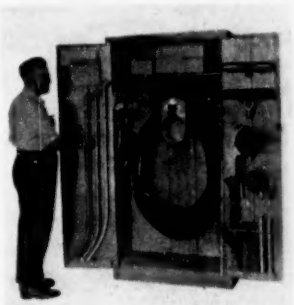
The pump sets are viscous liquid pumps of internal gear type, designed for quiet, simple, long-lasting operation. Each set is a complete self-contained unit mounted on a structural steel base, and is ready for immediate operation when the necessary connections to the fuel lines and electric service are complete.

The pump sets are available in 100, 225, 400 and 700 gph capacities. Each set is shipped with a standard type base-mounted electric motor and equipped with a push-button type magnetic motor starter, strainer, pressure gage, relief valve, and necessary sheaves and belts.

More Information? Circle Item 23 on postcard, page 135

## Vacuum Cleaner Cabinet

A hose and tool cabinet designed for storing vacuum cleaning hose and cleaning tools is introduced by Air Appliance Div., U. S. Hoffman Machinery Corp., Syracuse, N. Y.



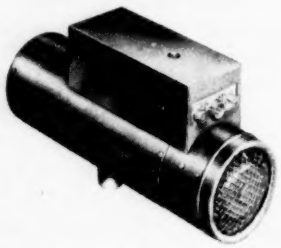
The cabinet meets the need for a better system of accessories storage by users of industrial vacuum cleaning equipment. With a centrally located cabinet, equipped for utility and convenience, cleaning nozzles and tools can be easily replaced when not in use. Tools are protected from damage and loss, and plant housekeeping improved.

The cabinet is 18 inches deep, 40 inches wide and 78 inches high. It is made of heavy 18 gage welded steel with additional reinforcing.

More Information? Circle Item 24 on postcard, page 135

## Gas Engine Starting Heater

A new 60,000 Btu per hour heater for liquid-cooled gasoline and diesel engines is announced by Perfection Stove Co., Cleveland, Ohio. It may be used to pre-heat the engine, provide stand-by heating, or to give controlled booster heating while the engine is operating.



The unit heats the engine coolant, which in turn heats the engine. The exhaust gasses from the heater may be used to heat the battery and also may be directed into a special shroud provided for the oil pan, thereby heating the lubricating oil.

Heater action may be made completely automatic for thermostatically-controlled heating or it may be manually controlled by the operator. It has electric ignition and an electrically-operated blower. It is adaptable to the use of gasoline, kerosene or No. 1 fuel oil and has its own fuel pump and thermostat.

More Information? Circle Item 25 on postcard, page 135

## Drain for Pressure Tanks

A tank drain to make draining of hot water system pressure tanks easier is announced by H. A. Thrush & Co., Peru, Ind. The drain combines a vacuum breaker and drain valve in one inexpensive fitting which is installed in the drain tapping of any tank. To operate, close the stop valve, open the tank drain and remove the pipe plug. Air enters tank through the tube and the tank drains through the hose connection.

It is available in two tube lengths, No. 12 for 12 inch tanks and No. 14 for 14 inch tanks.

The drain is applicable to old jobs as well as new ones.

More Information? Circle Item 26 on postcard, page 135

## Amine for Corrosion Control

A control for corrosion in steam condensate systems resulting from the presence of oxygen and acid carbon dioxide, a film-forming amine, Hagafilm, is introduced by Hagan Corp., Pittsburgh, Pa. It is fed to the boiler in small amounts, on the order of two to three pounds per million pounds of steam.

The new product vaporizes with the steam and deposits a very thin, non-wettable protective film on all metal surfaces wherever condensation occurs and throughout the return system. If only part of a return system needs this protection, the amine may be injected into the appropriate branch steam line.

The material is supplied in both solid and liquid form. The solid is readily mixed with hot condensate to make a dispersion for feeding. The ready-mixed liquid emulsion may be more convenient for some boiler plants, particularly where needs are relatively low.

For convenience, the material is supplied as a solid in 55-lb drums, and as an emulsion in 55-gal drums, and 5-gal cans.

More Information? Circle Item 27 on postcard, page 135

## Two-Way Oil Tank Vent Cap

A completely new and modern two-way tank vent cap for venting fuel oil, gasoline or liquid chemicals has been developed by Sicard & Paul, Minneapolis, Minn. Called the 2 In 1, the unit fits two different pipe sizes. Only three models are needed to fit any pipe used in storage tank installations.

Pipe threading is eliminated. Vent pipes can be set closer to walls, because the installer need not allow room for installing. The cap is set on the pipe and tightened with a single set screw. Installation time is ten seconds or less, resulting in a substantial saving in labor costs and a greater profit margin for the installer. An Allen wrench is the only tool needed.

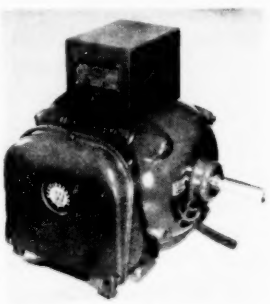
Rugged and durable, the all-purpose unit is safe, saves space, keeps out dirt, and can be used anywhere. Installations are more attractive and desirable. Each model is of one-piece, cast iron construction, designed to meet the specifications of all known building codes.

Model SP-125 fits 1¼ or 1½ inch pipe; Model SP-200 fits 2 or 2½ inch pipe; and Model SP-300 fits 3 or 4 inch pipe.

More Information? Circle Item 28 on postcard, page 135

## Low Start Current Motor

A new single phase motor that is both capacitor-start and capacitor-run is available from Westinghouse Electric Corp., Pittsburgh, Pa. Called the type CAP-2, the motor is made in 5-, 7½-, and 10-hp ratings, and is a 4 pole, 220 volt, 60 cycle motor.



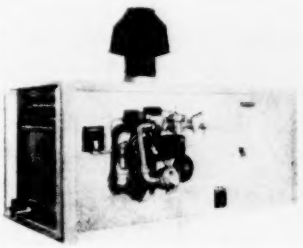
Capacitor-run motors operate very efficiently at near-unity power factor, and their design is such that starting current is reduced about 25 percent, with the same high starting torque. The auxiliary winding remains in the circuit during operation and is in series with the running capacitors. Relays merely remove the starting capacitors when the motor approaches full speed. The main winding is directly across the line. Elimination of the wound rotor, brushes, and commutator of the previous repulsion-induction design makes for a simpler motor with less maintenance.

Where three-phase power is not available, this new design will permit the use of larger single-phase motors for such applications as air conditioning units.

More Information? Circle Item 29 on postcard, page 135

## Gas Suspension Type Furnace

A 360,000 Btu per hour output gas-fired warm air suspension furnace, featuring an electronically-controlled power burner and special combustion chamber, is announced by Jackson & Church Co., Saginaw, Mich. The new model GA-450-S36 has a stainless steel combustion chamber. The electronically-controlled power burner provides positive air mixture and high operating efficiency. Electric eye protection enhances safe operation by automatically shutting off the burner if the fuel is curtailed for any reason.



The units measure 30 inches in length, nearly 36 inches in height and 38 inches in width. They are especially adaptable to situations where floor space is limited and where ductwork is to be minimized. The furnaces are designed for 4,600 cfm replacement at the bonnet and 3,900 cfm standard air.

A 15-inch blower and 1 hp, 1,750 rpm motor are used. Cabinets are finished in baked-on grey hammertex enamel.

More Information? Circle Item 30 on postcard, page 135

## Mild Steel Electrode

An improved E6010 electrode, the Airco 78E, for welding mild steel in all positions, is announced by Air Reduction Sales Co., New York, N. Y. It offers deep penetration without undercutting, a minimum of spatter, and uniform weld deposits without fingernailing.

The electrode is recommended for the fabrication of mild steel involving fired and unfired pressure vessels, pipe lines and all classes of marine work where high ductility and tensile strength are essential.

A booklet, Pocket Guide to Electrodes, is available.

More Information? Circle Item 31 on postcard, page 135

## Interchangeable Fan Hubs

The Burdco reversible, interchangeable fan hub, said to cut the fan blade inventory of the jobber, service repairman and accessory dealer by more than 75%, is announced by Alan E. Burden Co., Inc., Los Angeles, Calif.

The hub consists of two major parts. One is swedged into the fan spider, the same as the standard type hub. The second fits into the first to make a complete hub and is removable. The second can also be installed from either side, to make a front or back assembly. Two special, self-tapping screws lock the parts together. The screws inserted from the front side of the fan blade are removable and can be re-used when necessary. A set-screw locks the second part to the motor shaft.

The new development makes it necessary to carry only enough inventory to supply customer demands for three and four blade fans, including the various pitches. The rest, such as front or back hub assemblies, or the various bore sizes is cared for by stocking hubs in the standard bore sizes and, because hubs are interchangeable, customer needs can be supplied from stock in a complete range of sizes.

More Information? Circle Item 32 on postcard, page 135

## L. P. Gas Indicating Gage

A series of improved Criterion magnetic gages for indicating liquid level in L. P. gas or anhydrous ammonia storage tanks is announced by Rochester Mfg. Co., Rochester, N. Y.

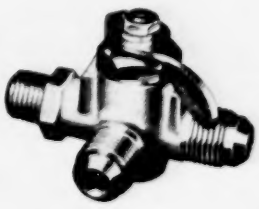
Designated as the 3190 series, these gages have been designed to provide service under severe conditions. Features include stainless steel head plates, interchangeable snap-on dial chambers, adjustable tubular steel support members, strengthened float rods, extruded aluminum gear yokes, shrouded gears, and corrosion-proofed steel floats.

The snap-on dial chamber is held in place by a circular spring which fits into a recess in the stainless steel head plate. Proper positioning of the chamber is insured by a key and groove arrangement. A newly-developed gear segment, with a shroud which rotates with the gear, facilitates placement of the gage mechanism in compact heads, and at the same time protects the gear teeth against damage. Clearances for installation also have been increased. The teeth on both the gear segment and the pinion are of unique design providing free rolling contact and close response.

More Information? Circle Item 33 on postcard, page 135

## 3-Way Valve for Oil Lines

A new three way valve is added to its Kantleak line by Anderson Brass Co., Detroit, Mich. The 2-tank valve is manufactured from brass forgings for maximum service on fuel oil line installations. The solid bottom and packed top design gives assurance of trouble-free operation under all conditions.

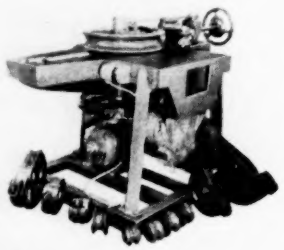


Use of this valve on original equipment makes an easy job of hooking up an extra oil tank when needed.

More Information? Circle Item 34 on postcard, page 135

## Pipe Bending Machine

The Type 2PBR pipe bender is added to the line of American Pipe Bending Machine Co., Poultney, Vt. Designed for power application to the company's Type A-30 hand bender, the device is engineered to bend ½ to 2-inch pipe at radii approximately five times the pipe size, up to 180 degrees. The minimum radius of bend it will handle is five times the pipe size; the maximum radius of bend, 13 inches.



The new bender will handle bends up to 1½ inch extra heavy and 1½ inch double extra heavy; however, it is not designed to be used for heavier bends. Its capacity covers a wide range in general use for maintenance bends, indirect heating, conduit bends and for general plant and property maintenance where radii within the capacity of the machine can be used to eliminate fittings and to speed up piping installations.

More Information? Circle Item 35 on postcard, page 135

## Heavy Duty Flexible Sheeting

The addition to its line of flashing materials of a heavy duty impermeable sheeting, Nervastral Seal-Pruf Type H-D, types No. 30 and 60, for flashing, membrane waterproofing, and pipe and duct wrapping, is announced by Rubber & Plastics Compound Co., Inc., New York, N. Y.

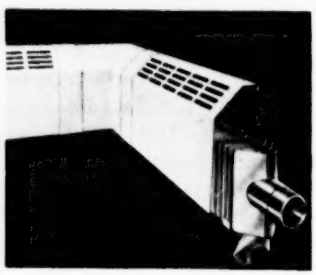
New properties are added to this sheeting including high mechanical strength, tear resistance, and bursting strength, and flexibility at below-zero temperatures. Unaffected by acids, alkalis and dry and wet rot, the material does not bleed or stain.

More Information? Circle Item 36 on postcard, page 135

## Baseboard Heater for Homes

An all-steel baseboard radiator for residential heating is being manufactured by Slant-Fin Radiator Corp., Brooklyn, N. Y., for steam and hot water systems.

Suited for economical series loop installations for the budget home field, the large diameter 1¼ inch heating element is said to permit longer runs, resulting in trouble-free service on both new and remodeling jobs. Because of the V-shape fin construction, there is more heating surface per fin, the company claims, allowing a faster, uniform distribution of heat at floor level.



Resilient notched flange eliminates snapping and buckling of fins and the company's process of force-fitting a bond between fins and pipe results in permanent heat transfer. Elements are available pre cut and threaded at the factory to any length required, saving contractors on-the-job labor costs.

Requiring no drilling or screws, the front cover and accessories snap on or telescope and the floor mounted brackets assure quick installation. The baseboard, completely installed, blends well with any interior, measures 8¾ inches high from the floor and projects 2⅛ inches from the wall.

More Information? Circle Item 37 on postcard, page 135

## Packaged Hot Water Boiler

Designed for hot water heating of residential, commercial and industrial buildings, the Rex gas-fired automatic packaged boiler is introduced by The Cleveland Heater Co., Cleveland, Ohio.

Illustrated is the 2-burner Model 280-HH. It is equipped with two double copper coils, circulating water pump and automatic controls. The controls are pre-assembled at the factory to help cut on-the-spot installation time and labor costs. Input rating is 90,000 Btu per hour.

Also included in the line is a 1-burner round heater, Model 180-HH. This unit is made to individual specifications and on special order only. It is a lightweight model, equipped with one double copper coil and automatic controls. It can be mounted on wall brackets or can be suspended from the ceiling. Input rating is 45,000 Btu per hour. Both units are AGA rated.

More Information? Circle Item 38 on postcard, page 135

## Antiseptic Compound for Air Filters

A germicidal compound sold under the trade name of Germ-Stop has been developed for mixing with standard viscous air filter adhesives. The product is distributed by Herkimer Co., New York, N. Y.

Inventor Herbert Herkimer states that the compound not only destroys infectious bacteria but also increases efficiency of the filter for types of dust particles called non-polar or non-wettable, such as carbon black, which ordinarily have reduced affinity for untreated viscous compounds.

The product is sold to filter manufacturers for mixing with standard adhesive in the portion of 1 gallon of germicide to every 60 gallons of adhesive. Directions for labeling cartons of treated filters to comply with regulations of the Food, Drug and Cosmetic Act are provided.

The germicidal ingredient is virtually odorless but of extremely high potency. The mixture of ingredient and adhesive is said to be harmless to human beings. Adoption of the process should not cause any addition to existing filter production methods or equipment. Cost of the additive should not exceed an additional 0.5% of untreated filter cost. The product is offered under license to all filter manufacturers and the Herkimer Company acts as exclusive distributor to licensees only.

More Information? Circle Item 39 on postcard, page 135

## Valve Actuators

Designed as package units for installation directly on the valve in service, on valves at manufacturer's plant, or at distributor's warehouse, a new line of Ledeen valve actuators is available from Ledeen Mfg. Co., Los Angeles, Calif.

These actuators are for the automatic operation of gate, plug, diaphragm, butterfly, pulp stock and other flow control valves, and are mounted directly on the valve without need of outside support. Operated by air, gas, oil, water or steam, they feature power operation and direct or remote control.

The line is illustrated and described in Bulletin 3000.

More Information? Circle Item 40 on postcard, page 135

## Enclosed Turbine Pump Motors

Horsepower ratings of totally-enclosed and explosion-proof vertical pump motors have been increased to 75 hp. by U. S. Electrical Motors Inc., Los Angeles, Calif. Available with either hollow shaft or solid shaft construction, these motors are designed for powering turbine pumps in refineries, sewage disposal plants, dangerous, dusty or dirty locations.

The totally-enclosed vertical motors are ideally suited for service in plants or locations where non-explosive conditions prevail, for protection against non-combustible dust, dirt, moisture, abrasives and corrosive-forming drippings. Both type motors are double-enclosed for fullest protection with generous size built-in fan for rapid heat dissipation.

More Information? Circle Item 41 on postcard, page 135

## Packaged Cooling Towers

Six new models of Therm-O-Jector one-package cooling towers are offered by Imsco Mfg. Co., Div. of Industrial Maintenance Service, Inc., Dallas, Tex. The six new models are for 3, 5, 7½, 10, 12½ and 15 ton capacity and are completely equipped and assembled at the factory.

The towers are built for gravity flow. A three-directional water distribution trough eliminates the necessity for sprayer and makes a constant even distribution of water. All metal is treated and covered with corrosion-resistant finish. One motor operates the centrifugal blower and pump. Upward discharge of blower simplifies the installation. Motor and pump are mounted in enclosed compartment to protect from moisture.

More Information? Circle Item 42 on postcard, page 135

## Portable Oil Heater

The Model PH-2 Porta-Heet, a portable self-contained low cost oil heating unit, is a new product of Auburn Burner Co., Auburn, Ind. It may be used for heating in winter or for fan cooling in summer and distributes heat evenly on all sides from the bottom of the heater. It uses No. 2 fuel oil.

Applications include pre-heating of buildings under construction, drying of fabrics, agricultural products, plaster, thawing of frozen ground and pipes, and similar uses.

Device has a gun type burner, a heat output of 120,000 Btu per hour, blower capacity of 1000 cfm and an oil firing rate of .85 gallons per hour. Fuel tank holds 5 gallons and the unit is 19 by 20½ inches in width and 57½ inches in height.

More Information? Circle Item 43 on postcard, page 135

## Activated Alumina

Large tonnages of activated alumina, used as a dessicant, are offered by Reynolds Metals Co., Louisville, Ky.

The activated alumina being produced by Reynolds is said to be a high quality product that meets all current specifications.

Activated alumina is a product derived from aluminum trihydrate. It is prepared by eliminating about two-thirds of the chemically combined water of the hydrate in such a manner that the finished product has a tremendous surface area. This large surface area, in turn, makes a product capable of absorbing as much as 15% of its weight in water. Thus it is valuable for dehumidification.

More Information? Circle Item 44 on postcard, page 135

## Industrial Baseboard Enclosures

The type KS baseboard enclosures, designed for commercial and industrial installations, is introduced by Vulcan Radiator Co., Hartford, Conn. The front and top are one piece and the unit is mounted on a full metal backing similar to the company's Radi-Vector for residential use. Outline louvers are in the front skirt so that convection currents are directed away from the wall to improve temperature distribution.

Made of 18-gage steel, galvanite or prime coated, style KS enclosures can be furnished in lengths of 3 inch increments up to a maximum of 8 feet in one piece. A full line of accessories is available, including joining pieces, Flexi-Corners, and end enclosures. Radiator elements are hung from the backing by rod-type hangers.

Catalog 625 is available.

More Information? Circle Item 45 on postcard, page 135

# Experience is my Classroom

By T. W. REYNOLDS

**• DEVELOPMENTS IN AIR CONDITIONING**

Even the construction shack is air conditioned today, at least one is so treated at the site for the Algiers Hotel in Miami Beach. They even have carpet on the floor. Only those who have worked in a construction shack can realize how hot and drafty these shacks can become and how hard the bare boards can be on the feet.

It's rather an abrupt transition to change the subject from the lowly construction shack to the 24-story Lever House on Park Ave., in New York City. This building with its stainless steel glass facing and three year-around air conditioning zones per floor is fascinating to the writer. There are wood burning fireplaces in special rooms, ozone treatment for kitchen exhaust to eliminate odors and the blue-green glass in the 1400 windows is chemically treated to absorb more than two-thirds of the solar energy. It's quite a surprise to learn that there are no shops on the ground floor, a survey having shown no substantial return on the investment. Public gardens take their place.

Some one in Dallas, Texas, says that in view of water shortages, air conditioning water from the street mains should go back again at some point downstream. He says he has done this.

Smoke as produced by high speed machine operations is removed by oil mist control. Other advantages are clean surroundings, less building maintenance, better natural and artificial lighting, and no hazard from fires or slippery floors due to oil. With these things in mind, the Air Conditioning Division of the Westinghouse Electric Corp. has redesigned its Precipitron oil mist control unit. Not so long ago the ventilation load to remove oil mist was quite a tax on the air conditioning system. We then had no oil mist removers.

The 15-story Johnson wax research laboratory also has a number of novel features. Round mezzanine floors alternate with square floors, one advantage of which is headroom for high laboratory equipment along the walls of the square floors. Famous-Barr in its air conditioned department store at St. Louis uses the exhaust air from the store to keep its customer entrance tunnel free of condensation. Milwaukee Road's Hiawatha dome shaped glass roofed railroad cars are double decked, so the fellow on the upper deck needs air conditioning the most. Ducts are also of glass and the refrigeration provided is 20 tons per car compared to 8 tons for a sleeping car or coach.

The new air conditioned 400-room Terrace Plaza in Cincinnati attracts interest because (1) it is windowless for the first seven floors used for commercial purposes, and (2) it is a combined hotel and commercial building. The additional ten stories which constitutes the hotel portion, uses the maximum amount of glass. There is a 10 ft sealed picture window in each guest room. The lobby is on the ninth floor. Design of the air conditioning system had to be made suitable for 8 hours of operation per day for the commercial floors with 24 hours of air conditioning for the hotel.

While the old fashioned awning reduced the air conditioning load by shading, unfortunately its effectiveness was offset somewhat by absorption and pocketing of heat. Modern awnings have side flaps for the amount of shade desired and some are arranged for continuous ventilation. Hurricane or wind protection is also provided and this even where used for houses in northern climes. Sun and rain causes no deterioration of these awnings.

An all-aluminum awning has sides that fold in at will; the top closes for hurricane protection or for burglar protection while away. Being curved, they look good open or closed; when open, ventilation is provided due to slatted construction. Tests prove the awnings good for winds up to 140 mph. Another company has an awning of either aluminum or masonite that will open or close from the inside or outside at a moment's notice. Side flaps keep out the rain.

**• FINDING THE LEAK**

Radioactive iodine (a by-product of atomic science) when added to the water will disclose a leak by means of the radioactive isotope. It is a convenient method of locating the precise point of leakage in a radiant heating floor system. Other usages are checking the radioactivity of smoke to know how much coal went off as gas, the amount of the residue, and the amount of sulphur content. Placed in some slight amount within a process line the isotope can be used to show when a different liquid comes along or it can be used as a signal to start booster pumps. Determining the amount of piston wear is still another use. This is done by measuring the radioactivity of the lubricating oil from piston rings.

**• LATE DEVELOPMENTS**

A freezer helps a fishing tackle shop sell live bait in Atlantic City, N. J., and two-temperature refrigerators are now the thing.

Chemist Eugene Houdry coats some porcelain rods with platinum alloy, the alloy being a catalyst that oxidizes soot and gases into odorless but very hot carbon dioxide. It may be used in a chimney or vent from some ill-smelling process and the heat reclaimed. It is not available as yet at low cost to home owners.

(*Continued on page* 120)

*"We prefer*

# REVERE COPPER WATER TUBE

## TO ALL OTHER MATERIALS

*for Radiant Panel Heating because of its easy workability, permanence and the assurance of a quality job"*

*says* A. C. HARDEN
*President*
Harden Heating & Air Conditioning Co., Elmwood Park, Ill.

**. . . AND MR. HARDEN HAS OVER 550 COMPLETELY SATISFACTORY INSTALLATIONS IN HOMES AND CHURCHES TO BACK UP HIS STATEMENT!**

"Because we have a reputation for quality work to uphold, we can't afford to take chances and use inferior materials. In addition, Copper Water Tube is so easy to bend, so easy to work with in the tightest spaces and requires no thread cutting so that it saves us a lot of installation time. We have also found that we can place the utmost faith in the fittings when using Copper Water Tube."

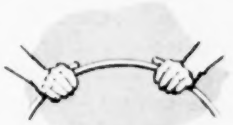
"Those are the reasons we prefer copper to all other material". And Mr. Harden speaks from experience. For he has installed copper radiant panel heating systems in over 50 churches and more than 500 residences, and all are completely satisfactory in every respect. The oldest has been in operation for 7 years.

Take a tip from Mr. Harden's experience . . . keep out of trouble with copper.

Now with restrictions on copper ended, there isn't any reason why you can't use Revere Copper Water Tube on your next job . . . for radiant panel heating, hot and cold water lines, underground service lines, processing lines, and waste stack and vent lines. See the Revere Distributor nearest you today. And, if you have technical problems, he will put you in touch with Revere's Technical Advisory Service.

## WHY REVERE COPPER WATER TUBE IS PREFERRED BY—

**Architects, Builders, Plumbing & Heating Contractors**



### EASY TO BEND

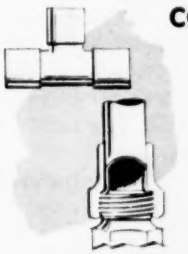
*Saves Time*

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions. Hard temper by hand bending tools.

### HANDY LENGTHS

*Save Fittings . . . Labor*

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.



### SOLDER OR COMPRESSION FITTINGS

*Need Less Work Room . . . Save Metal*

No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

### NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.

**REVERE**

**COPPER AND BRASS INCORPORATED**

*Founded by Paul Revere in 1801*
230 Park Avenue, New York 17, N. Y.

• • •

*Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.*

**SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS**

(*Continued from page* 118)

Allis-Chalmers Mfg., Milwaukee, Wisc., has prepared three interesting booklets on centrifugal pumps. Things to keep in mind are that the more water a centrifugal pump throws or discharges, the greater the suction or vacuum at its inlet. This increases the tendency for the water to flash and thereby reduces pump capacity. Vapor bubbles move to high pressure areas in the pump where they collapse with the result that the water pits the water impeller through water hammer.

Another point is that the higher the lift, the greater the liability for any vacuum to destroy the suction lift. Suction can also be lost because of air pockets formed at reducers in horizontal lines. To prevent this, eccentric reducers should be used with a flat side upward. Lift is sometimes also reduced by using second hand pipe that establishes too much friction because of poor pipe condition or use of smaller pipe size through mistaken economy.

**• BUILDING WITH LESS AND LESS**

As building costs increase so does the tendency to reduce product and building size, to substitute other materials and to eliminate this or that, even to much of the space for maintenance around equipment. There have been some complaints about the last mentioned point. As a consequence, builders are reviewing each item entering into construction to find out if its use is justified. Thus, the chief engineer for one large developer of housing has directed attention to long established customs in plumbing which he considers unnecessary.

The fresh air inlet, presumably so-called because it may let air into the plumbing system to remove foul odors by way of the vent above roof, may turn out to be a foul air outlet when sewage flows and pushes out the air ahead of it. One on the terrace of my former home did just that and usually with an accompanying gurgle, much to my embarrassment when company was present. In any event, some fresh air outlets do put bad air back into the house through open windows.

Now the fresh air inlet (foul air outlet) is mostly needed to relieve air lock because of the house trap. If we do not need the latter, we do not need the former. If, however, there is a blast in the street sewer it is said the liquid seal of the house trap could be displaced. On the other hand, there are numerous fixture traps to absorb the blast, and shortly there should be a return flow or new flow from fixture usage.

This engineer points out that the house trap blocks the flow of sewage, hence it is provided with one or more cleanouts, and that the house trap is not needed if the fixture traps remain sealed. Should one lose its seal, the odor within the house plumbing will enter the house whether or not there is a house trap.

He also points out that soil pipes would have a self scouring action if they were reduced from 4-inch to 3-inch size. I have seen 4-inch soil stacks removed after long use which were reduced in size by fouling, whereas a 3-inch soil stack would be found free from slime. The smaller size would certainly reduce cost of both building construction and plumbing material.

The main vent terminates so high above the roof that it becomes unsightly. If its size and exposed height is reduced there should be less heat loss, therefore less liability to frost closure, so says the builder. He has a point there; he is also an advocate of the use of smaller hot water pipes. The smaller the pipe, the less heat and water that is wasted. There is a smaller amount of water remaining in the pipe to give up its heat: less cooled water must be drawn off and wasted before hot water is discharged at a faucet and finally to the smaller heat losing surface of the pipe.

The use of small pipes for forced warm air heating is still another conservation measure. They readily go inside the usual stud wall, pass around beams and provide headroom in basements and crawl spaces. The smaller the hole through the floor for such pipes, the less time and labor is required for cutting the pipe and hole and the less that building construction is weakened. Fittings of low resistance can be used to compensate for higher friction.

**• INSULATING NEWS**

Covering the fittings is the most time-consuming part of a pipe insulating job. A good job requires neat appearance, permanency, and no cracks or partially unfinished points for heat leakage. With these things in mind, pre-formed insulating pipe fittings have been constructed principally of glass fibers.

For similar reasons, end protectors have been developed for pipe covering where it meets floors, ceilings, walls, unions, valves and specialties. These protectors are of 20 gage sheet aluminum and are made to automatically adjust themselves to expansion and contraction. Their use prevents covering ends to halt crumbling and avoids the labor of sewing canvas ends of covering.

There is a form board for use as a base for the gypsum cement slab roof. For a school room in Perrysburg, Ohio, it was used to cut down costs by serving as both roof deck and ceiling. It also provides acoustical and insulation qualities. This insulation when used below floors reduces heat losses and maintains floors so that they are warm to the feet.

**• PLASTIC TUBING FOR RADIANT HEAT**

I am in receipt of a letter from the Johnson Plastic Corporation (Chagrin Falls, Ohio) in reply to a query of mine as to the use of plastic tubing for radiant heating. They advise in substance as follows:

"In this area around Cleveland we have a number of successful installations, especially so because the boiler water temperatures are maintained at about 120F. Temperatures would even be less in the southern states, but north of Cleveland, water temperatures may be 190F. Of course, our pipe is not as satisfactory at this temperature since in softening, the allowable working pressure is reduced. Our recommendation is for use not in excess of 130F. Metal connectors are also recommended because of the tendency of the hotter water close to the boiler to distort plastic fittings.

"You mention the idea of simply bending the exposed flexible pipe around the baseboard in a home to obtain

(*Continued on page* 148)

# PRODUCT APPLICATIONS

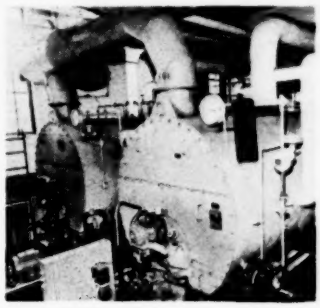
## New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

### Steam Generators Help School Grow

**PROBLEM:** An engineering survey prior to boiler replacement at the Weston Collegiate and Vocational School, Weston, Ontario, showed that heating requirements resulting from an 18-room addition could not be met by old stoke-fed boilers. Installation of conventional boilers capable of handling the increased steam load would mean lowering the boiler room floor level five feet.

**SOLUTION:** Two 150 horsepower Cleaver-Brooks package type boilers designed to operate at 15 lb pressure and equipped to burn Bunker C oil comfortably serve the expanded steam requirements, and the low head room feature permitted installation within the confines of the existing boiler room.

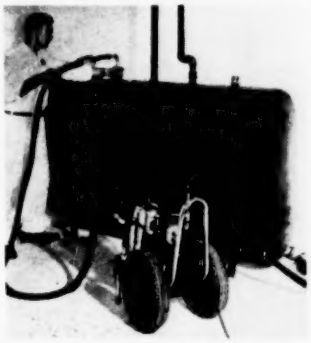


**RESULTS:** No construction work was necessary to fit the new equipment into the existing boiler room. The space saving feature of the new boilers and the elimination of coal bins left sufficient space for an additional classroom. Based on the average construction cost for each of the 18 rooms, this represented an estimated saving of thirty thousand dollars. Consequently, net cost of the boiler equipment was about six thousand dollars. A rough estimate taken at the end of the heating season indicated that fuel costs, instead of being higher, are substantially lower.

### Vacuum Cleaning with Rotary Pump

**PROBLEM:** The Visa-Clean Corp. of Randallstown, Md., in designing a new machine for vacuum cleaning of liquid storage tanks, required a pump capable of handling sludge, dirt, water and other impurities.

**SOLUTION:** A rotary pump known as the Worthington Corp. 2GA is the heart of the new machine. It can be applied to almost any type of tank and almost all liquids. It has been field tested for four years on over 9000 jobs in the Baltimore area.



**RESULTS:** A small portable unit has been developed and is being promoted mainly for use in cleaning fuel oil tanks as a preventive against oil burner breakdowns from clogged controls, nozzles, and burner tips.

### New Reefers Challenge Trucks

**PROBLEM:** Transport of frozen foods has been the special field of trucking companies owing to the difficulty in keeping railroad refrigeration cars moving over long hauls. Normally the refrigerated railroad car has to stop over for re-icing every 24 hours.

**SOLUTION:** A new type mechanical refrigeration for railroad cars threatens the competitive position of trucks in shipment of fresh and frozen foods. The Sante Fe Railroad has developed a mechanical refrigerated car in cooperation with engineers of The Trane Co. The Trane system for railroad cars is a self-powered, diesel-driven unit mounted at one end of the car. It serves both in the sub-zero range for shipment of frozen foods or in higher ranges for fresh produce.

**RESULTS:** The largest railroad refrigerator shipment of frozen food (strawberries) reached the east coast recently from California growers. Although time elapsed for the journey was fourteen days, since the car was held at a siding before unloading, the temperature inside was —10F.

### Laundry Cooler Heats Wash Water

**PROBLEM:** In the basement of the 1,500 bed Grace-New Haven Community Hospital is one of the largest underground air conditioned laundries in the world. The laundry requires 150 tons of refrigeration to maintain comfortable working conditions.

**SOLUTION:** Two 75-hp Chrysler Airtemp radial compressing units were specified to handle the cooling load. Both heating and cooling coils are located in air ducts supplying outside air exclusively. Airtemp compressing units serve a two-circuit water chiller with coils, blowers, and air filters located in a first floor room directly above the laundry. City water, used in the condensers to cool the refrigerant, is heated to about 100F, then piped to the laundry room where it is used in the washing machines.

**RESULTS:** Large underground laundry is provided with year around air conditioning and heat removed from work areas is used to heat wash water.

*(More Product Applications on page 124)*

*Samuel G. Wiener, FAIA; E. M. Freeman, CE, architects and engineers; Paul O. Rottmann, associate electrical and mechanical consultant*

## *This Honeywell Customized Temperature Control installation helps you*

# Learn about your business—from an airport

*Why customized temperature control is becoming a "must" for all types of buildings*

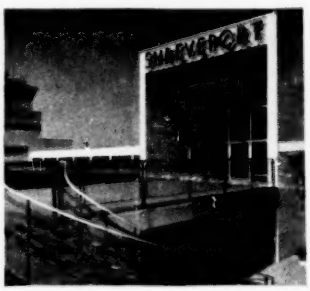
How do you make sure of comfort in a modern building that has lots of glass and a spread-out design?

In particular, how do you answer this over-all question when your building has a dozen varying comfort requirements such as a high ceiling lobby with busy outside doors, a waiting room that's often crowded, many small private offices, separate storage and baggage areas?

And how do you make sure, operating 24 hours, the temperature control system will give the flexible, dependable service you *must* have?

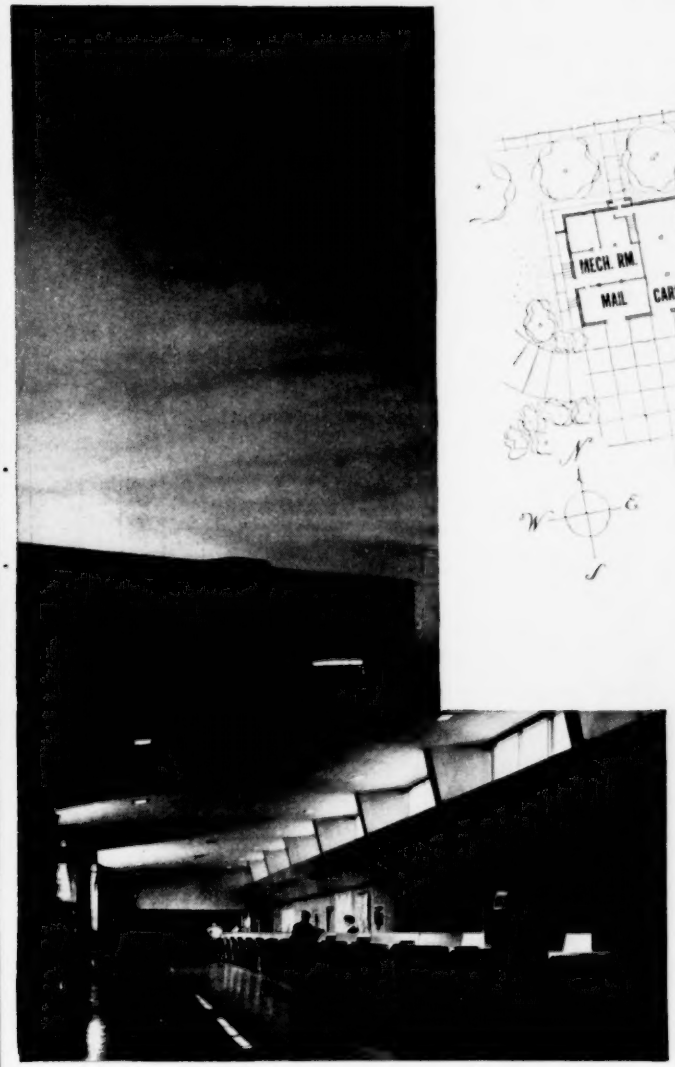
With modification, these major questions which Shreveport, La., airport officials and their professional advisers had to answer, can be applied to the businesses of your clients. The answers can be stated in five words: Install Honeywell Customized Temperature Control. This is the answer officials of the Shreveport airport have found eminently satisfactory. It is the answer for you, too.

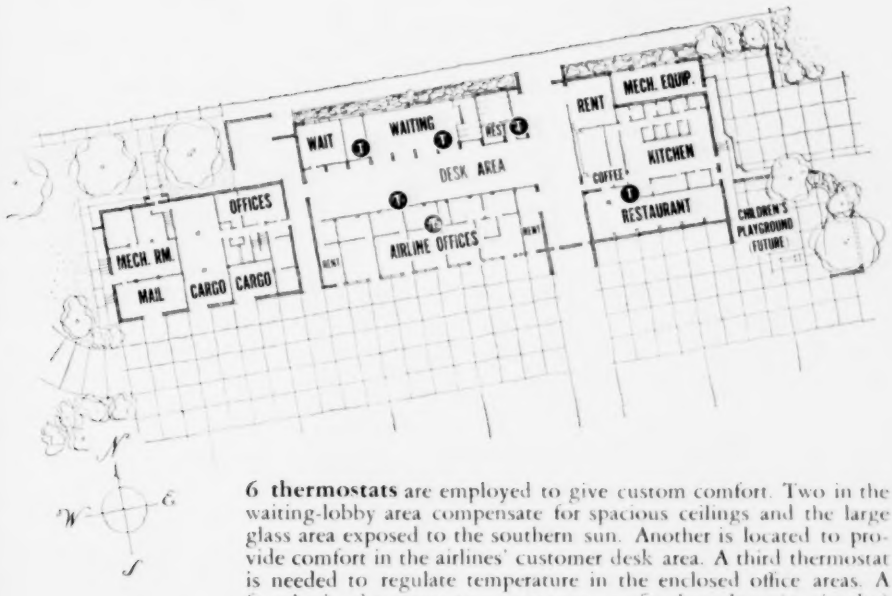
Key reason why this is so is found in the word *customized*. This means that whatever the control requirements, Honeywell Customized Temperature Control *designed to meet the needs of your building* is your solution. This applies to heating and cooling, ventilation and humidity control.




The customized installation in the case of the Shreveport airport included careful selection and strategic placement of thermostats as indicated on the floor plan.

Two of the specific problems solved by the Honeywell Customized Temperature Control installation are brought out in the captions beneath the small photos.






**The problem** in the counter area was to provide comfort—for passengers and airline personnel. Comfort load varies greatly with occupancy of room, the amount of heat or cold coming from outside. But with Honeywell Customized Temperature Control in charge of comfort, conditions are right all the time.

**The problem** in the dining room was to provide comfort regardless of "weather effects" of large windows, and whether there were two diners—or two hundred. And with Honeywell Customized Temperature Control on the job 24 hours a day it's comfortable in the dining room—no matter what.

**6 thermostats** are employed to give custom comfort. Two in the waiting-lobby area compensate for spacious ceilings and the large glass area exposed to the southern sun. Another is located to provide comfort in the airlines' customer desk area. A third thermostat is needed to regulate temperature in the enclosed office areas. A fourth, in the restaurant, compensates for heat loss (or intake) through big south windows.

***For comfortable, even temperature in new or existing buildings—of any size—use Honeywell Customized Temperature Control***

Whether it's an airport, hospital, apartment, church, school, office, factory, store, garage—or any size building—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate"—and save fuel besides.

For facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 104 across the nation. Or mail the coupon today.

**Claude L. Hamel, Shreveport airport manager, says:**

"It's true that we've got a great many temperature control problems here. And it's gratifying to report that Honeywell Customized Temperature Control handles them all so well."

MINNEAPOLIS
**Honeywell**

First in Controls

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-8-160, Minneapolis 8, Minnesota
Gentlemen:
I'm interested in learning more about Honeywell Customized Temperature Control.

*Name* _____

*Firm Name* _____

*Address* _____

*City* _____ *Zone* _____ *State* _____

## Machine Stitches Insulation to Duct Metal

**PROBLEM:** Universal Sheet Metal Corp. of New York found that conventional methods of fastening glass fiber insulation duct liner to sheet metal were costly.

**SOLUTION:** Universal got together with two other manufacturers to devise a means of applying insulation to duct metal. A wire stapling machine manufactured by Bostitch Inc. was used to fasten Ultralite glass fiber insulation manufactured by Gustin-Bacon Mfg. Co., Kansas City, Mo., to the sheet metal in a single operation. The metal is delivered in standard 36 by 96 inch sheets; the Ultralite in rolls ½ or 1 inch thick by 48 inches wide by 200 ft long. The Ultralite has a vinyl spray coating on one side, facing the air stream in the duct. Metal and insulation are cut to size, the flat sheet is placed on a holding jig under the staple stitcher. The Ultralite is dropped onto the sheet and metal buttons are positioned on top of the insulation. The stapling machine stitches the insulation to the sheet through the metal buttons. The staples are formed from a coil of hardened steel wire. When the flat sheets are faced with insulation, the edges are locked jointed, then braked and joined.

**RESULTS:** Compared with other methods, savings in time, space, manpower, and materials are considerable. Stapling forms a more permanent bond than adhesive methods.

## Insulate Stack for Worker Comfort

**PROBLEM:** At the Hutsonville, Ill., Generating Station of Central Illinois Public Service Company, the stack had to be constructed inside the building because the station is located next to a railroad siding. The stack is 12 ft in diameter and more than 130 ft high inside the station, representing a surface of about 5000 sq ft generally at about 260F. Working conditions in the vicinity of the stack were extremely uncomfortable.

**SOLUTION:** A 2½-inch thick layer of 85% magnesia blocks was wired into place covering the stack and further secured with hexagonal wire mesh. Two ¼ inch coats of asbestos insulating and asbestos hard finish cement were then troweled on and the insulation finished with a pasted jacket of 8-oz canvas.

**RESULTS:** Based on past experience, Sargent & Lundy, Engineers, have found that this insulation will have a surface temperature of about 25F above the air temperature and thereby reduce discomfort of employees.

## Largest Noise Reduction Unit

**PROBLEM:** At the Lever House, New York, 24-story glass and stainless steel headquarters of Lever Brothers Company, intake fans are required to handle 200,000 cfm. Engineers feared that, uncontrolled, the blowers would make so much noise as to disturb occupants of adjoining buildings. The problem was to reduce this noise to equal or fall below ambient noise level of the neighborhood.

**SOLUTION:** A silencing system was designed and built by Industrial Acoustics Company after a noise survey was made in the vicinity, taking into account the fact that the blowers operate from 7 a.m. to midnight. Installation of IAC louvered acoustic panels for high frequency absorption and Helmholtz resonators for low frequency attenuation was one of the techniques used to reduce the noise level.

**RESULTS:** After installation of the device, it was impossible to pick up sounds from blowers by ear or electronic instruments. Occupants of the apartment house remarked that the blowers must have been shut off despite the fact that all were going full blast. Pressure drop through the louvered acoustic panels was not excessive because of the low velocities and wide area involved.

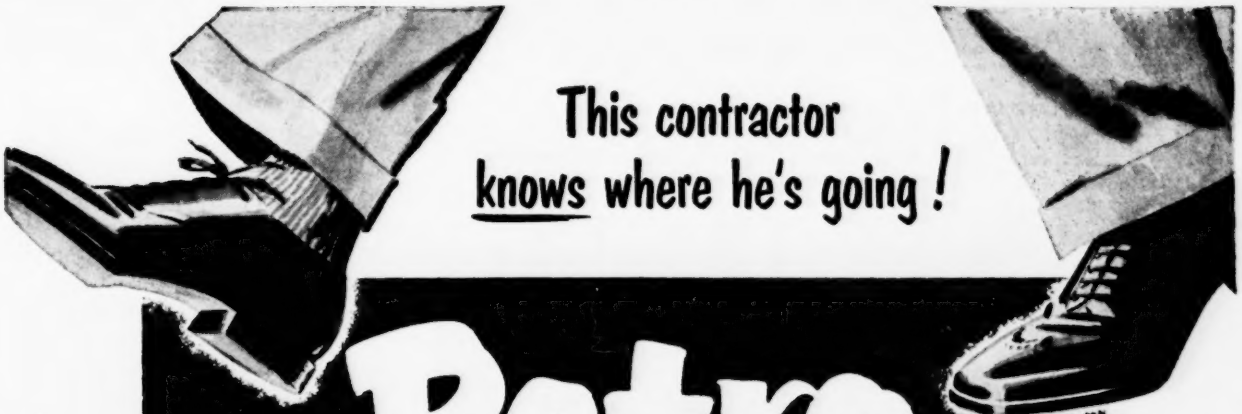
## Glass Lining Ends Stack Corrosion

**PROBLEM:** Acid condensate in smoke is a corrosive factor which shortens the life of industrial stacks made of steel. It has been estimated that more than 5000 such steel stacks are replaced annually in the United States.

**SOLUTION:** The A. O. Smith Corp., experienced in fusing of glass to steel in manufacture of vessels ranging from water heaters to huge beer storage tanks, created and erected the first glass-lined smoke stack at its own Milwaukee plant. The stack was made in 44 ft lengths, 6 ft in diameter, with a total of 85 ft in over all length. Using techniques developed over years of experimentation, A. O. Smith coated the stack sections inside and out with two layers of glass, each approximately five one-thousandths of an inch in thickness. Bonding of glass linings was at 1600F.

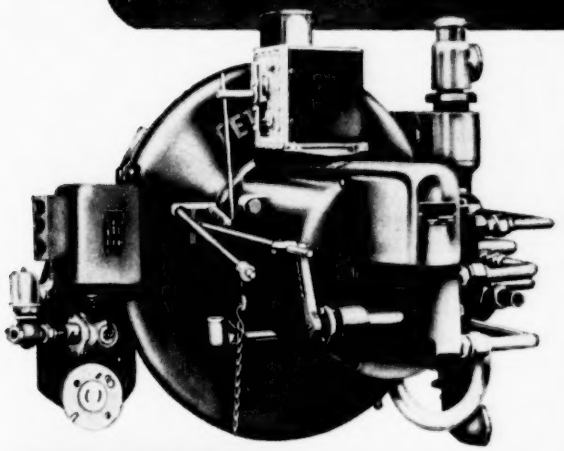
**RESULTS:** Sections of glass coated steel hung in active smoke stacks for periods ranging up to a year of testing have shown no corrosive deterioration, according to Wayne Deringer, director of ceramic research.

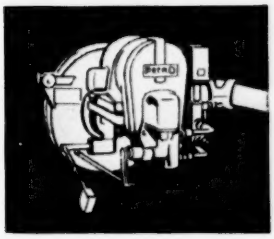
(*More Product Applications on page* 126)



This contractor knows where he's going!

# Petro oil firing





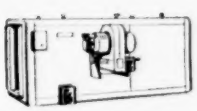
**INDUSTRIAL OIL BURNERS**
Rotary type. Burn low cost heavy fuel oil with complete reliability. Models for every industrial need. Capacities to 600 b.h.p.

**COMBINATION OIL-GAS**
The perfect answer to fuel shortages or price advantages. Install in most any boiler. Switch fuels at a moment's notice.

## Complete line for Home Heating

**Furnaces and Boilers**
Made in popular sizes to fit the heating needs of homes from 4 to 10 rooms. Extremely compact and attractive. Real fuel savers.

**Conversion Units**
Available for home and commercial use. Give unusual efficiency and fit in most any furnace or boiler. Capacities up to 20 gallons per hr.



**Horizontal Furnace**
Hang it or hide it—fits anywhere. Available in 5 models from 80,000 to 180,000 Btu's. Install in attic, basement, utility room or crawlway.

## HEATING CONTRACTORS CHOOSE PETRO OIL FIRING BECAUSE THEY KNOW IT'S DEPENDABLE

**CONFIDENCE** — You *know* that a Petro will "do the job." You *know* that a Petro will deliver exceptional fuel economy. You know, and your customers know, that you have installed the best!

**EASILY INSTALLED** — Petro models are compact and well built. Sound and solid construction, easy access to oil and ignition lines and protected wire connections make Petro a favorite.

**SIMPLE, DEPENDABLE PERFORMANCE** — Petro oil burners are not complicated by "gadgets." They are simple, dependable units that demand no pampering service.

**AUTOMATIC OPERATION WITH FLUCTUATING LOADS** — Petro oil burners are almost instantly responsive and are therefore especially efficient for automatic modulated firing.

*WRITE FOR COMPLETE INFORMATION*

**INDUSTRIAL-COMMERCIAL-RESIDENTIAL OIL BURNERS FOR EVERY FIRING NEED**

# PETRO

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*50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING*

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IN CANADA: 2231 ELOOR ST., WEST, TORONTO, ONTARIO

### Produce Mart Features Refrigeration

**PROBLEM:** Recently, the St. Louis Produce Market, Inc., entirely reconstructed facilities serving wholesalers. An ultra-modern produce market was built to replace dilapidated buildings and to eliminate truck congestion. Refrigeration to serve the new buildings was to be provided for 28 wholesalers.

**SOLUTION:** 25 of the 28 wholesalers selected their equipment manufactured by Kramer Trenton Co. A total of 73 large Kramer units were used throughout the new market. Banana rooms, frozen food storage rooms, and freezer rooms were equipped with Thermobank, Coolmaster, and other Kramer components. One wholesaler, the Raith Produce Co., makes use of 3100 cubic feet of freezer storage space held at minus 10F by two Thermobank systems each served by 7½ hp compressors.

**RESULTS:** The produce handling center is equipped with all modern devices for the handling and storage of produce without excessive losses from spoilage or traffic delays.

### Room Units Serve Hat Store

**PROBLEM:** A three-room office suite of the Resistol Hats, Inc. of New York City includes offices and showroom. Hats on display were subject to soot damage and deterioration caused by high humidity.

**SOLUTION:** Two 1½ hp Remington console air conditioners were installed. A survey showed that this type of unit could be purchased and installed for less than half the cost of a centralized system.

**RESULTS:** Office cleanliness, employee efficiency, and customer comfort have been improved. No plumbing or duct work was required and business was not interrupted during installation which required running a three-phase circuit connection and a window duct. The units can be moved should the company decide to change its location. Operating costs have been about $13 per month in summer for electricity and about $20 per year for maintenance. To handle the dirt problem, the firm operates one unit the year round. Humidity control has resulted in maintaining felt hats in good condition for showing.

### Airport Control Tower Cooled

**PROBLEM:** Rapid growth of air transport facilities in Phoenix, Arizona, resulted in construction of the new $5 million Sky Harbor Municipal Airport. Prominent among features of the airport is a unique control tower rising to a height of 100 ft and exposing occupants to the full glare of the Arizona sun.

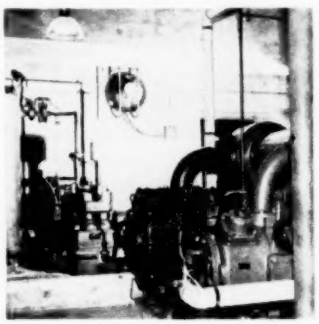
**SOLUTION:** The tower is constructed of sheet steel. The outer shell of the rising shaft of the tower is 9 ft in diameter, and an inner utility shell is 2 ft in diameter. The outer shell is lined its entire height with 2 inches of vegetable cork. An iron stairway between the inner and outer shell runs from the basement to the lower cab level. At the top are two hexagonal cabs, 16 ft mean dimension, supported on structural steel fins. Air traffic control is performed in the upper cab. The room is fully air conditioned and contains all the usual control equipment. Windows are double-glazed to restrict the passage of heat. Fifteen feet above grade level is an office for the chief controller. This office is also fully air conditioned. Heating and cooling equipment is housed in a basement 10 ft below grade. A Trane compressor, evaporative condenser, water chiller, and water circulators were installed in the basement along with the boiler. A Trane Climate Changer was installed in the chief controller's office. A Trane Multi-Zone Climate Changer located in the lower cab serves both upper and lower observation cabs.

**RESULTS:** In spite of an average daytime maximum temperature of 97F, indoor conditions are maintained to promote the comfort and maximum efficiency of control tower operators.

### Fans Remove Heat in Dam

**PROBLEM:** Davis Dam in Boulder City, Nev., produces electricity and aids in solving irrigation problems. Deep within the dam's thick walls, turbines and compressors grind away incessantly, producing great amounts of heat.

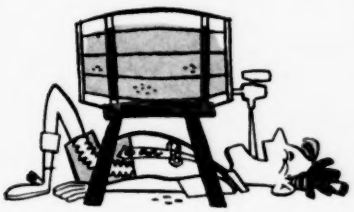
**SOLUTION:** The task of effectively exhausting this heat is performed by two Peerless Electric No. 13¾ blowers and 12 Peerless Electric PVS-18 exhaust fans. The latter are powered by 1/6-hp motors and mount 18-inch fans with a rated capacity of 2900 cfm. These fans are designed for single speed, two-speed, or three-speed operation from a single control unit. No other starting or control equipment is used. The larger blowers, used for general ventilation where duct systems are required, are designed to deliver large volumes of air.



**RESULTS:** Excessive heat is effectively removed from inside the dam structure by equipment manufactured by The Peerless Electric Co., Warren, Ohio.

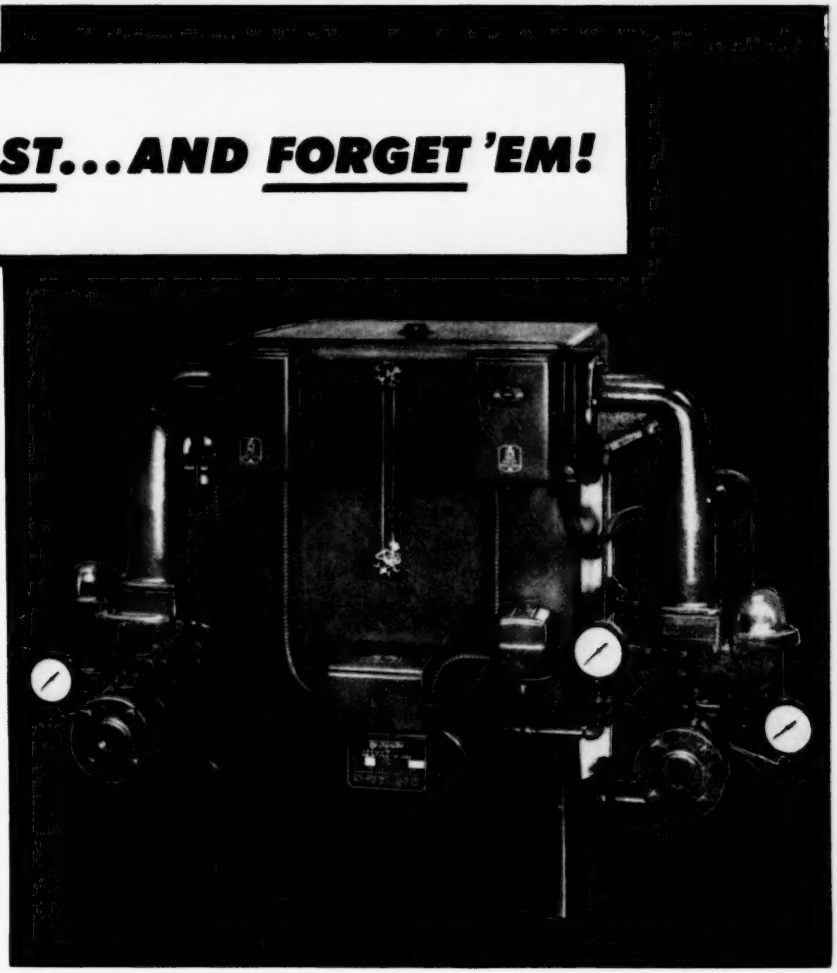
(*More Product Applications on page 128*)

# PUT 'EM IN FAST...AND FORGET 'EM!



"Low return lines"

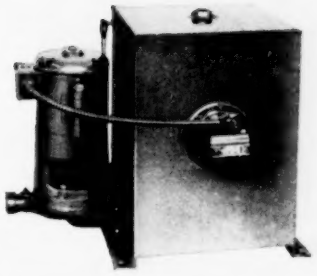
"Only one principal moving part"



***You Can Put Dunham Vacuum Pumps in fast*** . . . and for less . . . because they're simple to install. For instance, return lines are at such low level, 9⅛", there's no need for expensive "pitting." You just set three anchor bolts in the floor . . . and your Dunham pump is in to stay.

***You Can Forget*** Dunham pumps once they're in, too. For they pull and maintain . . . at low amperage . . . up to 26" vacuum without dependence on close clearances—and do it for years without repairs. For you see, there's only ONE principal moving part.

A single motor, mounted high and dry, easily handles BOTH air and condensate removal. Full range of sizes and types, both single and duplex models. Clip coupon for complete information.



***Dunham Condensate Pumps*** assure fast, positive removal of condensate. Completely wired, ready for immediate use. Side-mounted motors. Anchor bolts—not bars and bed plates—secure pump to floor. Single and Duplex models.

**DUNHAM** **VACUUM PUMPS**

**RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES**

**C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON**

C. A. DUNHAM COMPANY
Dept. HV-8, 400 W. Madison St.,
Chicago 6, Illinois

Please send Pump Bulletin.

Name _____

Company _____

Address _____

City _____ Zone ____ State _____

### Cruiser Cabin Air Conditioned

**PROBLEM:** The cabin cruiser, Rhonda II, owned by R. I. Ingalls, Jr., president of the Ingalls Shipbuilding Corporation, is moored in Miami waters and used much of the time under the warm Florida sun. Conditions in the cabin during periods at dock or cruising on inland waters were sometimes uncomfortably warm.

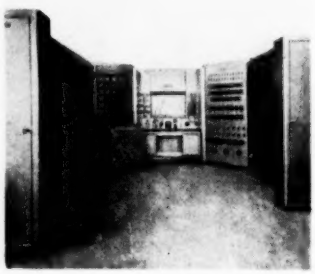
**SOLUTION:** A ¾-ton Mitchell room air conditioner, product of Mitchell Mfg. Co., was installed through the wall of the cabin with the outer cabinet extending onto the bridge alongside the wheel. The unit has been fitted with a specially designed mahogany cover matching the cruisers wood trim. A specially installed alternating current power plant operates the unit.

**RESULTS:** The cabin remains comfortable at all times while windows remain unobstructed. The mahogany case doubles as a shelf and table near the wall.

### Fluid Analogue Serves Gas Lines

**PROBLEM:** The Laclede Gas Company was faced with the necessity of calculating fluid flow in an extensive network of piping.

**SOLUTION:** The Standard Electric Company of Springfield, Mass., constructed a McIlroy fluid network analyzer, the first ever built for a gas company. The analyzer is an analogue computer designed for analyzing fluid networks. By making a physical analogy of fluid flow in a non linear resistor, called a fluistor, it is possible to obtain direct readings of pressure loss and flow rates in all members of a pipeline network. The analyzer may be used for analyses of all types of fluid systems. The network of pipes is represented by fluistors placed in receptacles permanently wired in a grid arrangement on the control panel. After the selection and placement of fluistors in the network has been made in accordance with loss coefficients of the system, and loads have been adjusted to represent respective fluid quantities, the analyzer is energized with d.c. power. Direct readings of the pressure and flow are then shown on a voltmeter and an ammeter at a scale calibrated to read fluid units.



**RESULTS:** At a recent demonstration, several actual problems of the Laclede Gas Company were worked out by the usual mathematical method but the results were kept secret. The same problems were fed to the analyzer and the two sets of answers compared. Agreement was amazingly close. One client saved more than twice the cost of the analyzer in a single analysis covering a small extension to a water system, according to the manufacturers.

### Dry Air Speeds Production

**PROBLEM:** At the R. P. Scherer Corp. of Detroit, the country's largest capsule shell manufacturers, automatic high speed production of medicinal capsule containers is dependent upon the rapid drying of gelatin shells. Circulating air blowers were fairly satisfactory on dry days, but production slowed during periods of high humidity.

**SOLUTION:** Tests showed need for conditions of 80F dry bulb with a moisture content of 35 grains per lb (25% R.H.). A Kathabar system of humidity conditioning, manufactured by Surface Combustion Corp., which removes the moisture by an absorption process, was found to be most practical.

**RESULTS:** Continuous, full production is now maintained. Similar Kathabar systems have been installed in Scherer plants in Canada and England.

### Carbide Bits Drill Masonry

**PROBLEM:** Installation of additional electric conduits in the New York City subways involved drilling hundreds of holes in extremely hard concrete. Steel star drills dulled and lost diameter after one hole and production rates were poor.

**SOLUTION:** A change was made to carbide-tipped bits in ¾-, ⅞-, and 1-inch diameters to be used in the same light air chipping hammers. Bits were produced by New England Carbide Co.

**RESULTS:** Carbide tipped bits drilled more than 150 holes at a fast rate before any dulling was apparent and each bit lasted for several hundred holes. Time lost for frequent bit changes and clearing of the tracks each time a train came through was minimized.

Send in a
**PRODUCT APPLICATION**
HEATING AND VENTILATING
148 Lafayette St., New York 13, N. Y.

**NEW**

Periodically, new motor-driven washer completely cleans cell plates—re-applies adhesive—by "push-button" operation. Moving nozzles clean thoroughly to full cell depth.

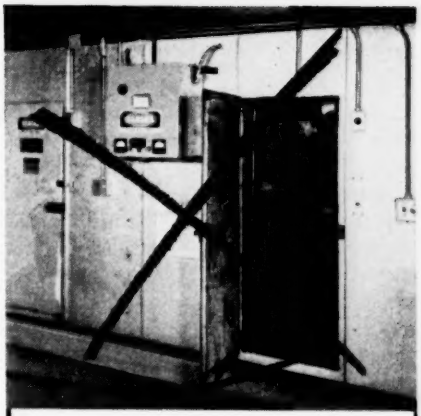
# NOW—"PUSH-BUTTON" WASHING FOR ELECTRONIC AIR CLEANER

Now, a new, low-cost, automatic PRECIPITRON® washer cuts maintenance costs and eliminates unpleasant inside-the-duct washing of cells.

This unique device features moving nozzles, making PRECIPITRON the easiest electronic air cleaner to service. After thoroughly cleaning the plates, the washer re-applies adhesive. Entire operation is under "push-button" control. Laboratory and field tests have proved that moving-nozzle washing is a "must" for proper cleaning.

Type PX PRECIPITRON, the electronic air cleaner, traps microscopic airborne particles of dirt, dust, grime and pollen which would pass through conventional filters. It fits into any heating, ventilating or air conditioning ductwork.

Learn how PRECIPITRON will keep the air in your building dirt-free at negligible cost. Call your local Westinghouse-Sturtevant office, or write: Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.



Maintenance men no longer need to enter enclosure to clean PRECIPITRON. New "push-button" feature does away with hot, wet tasks.

**WESTINGHOUSE AIR HANDLING**

YOU CAN BE SURE ... IF IT'S Westinghouse

J-80231

# NEWS OF THE MONTH

## BUILDING BY STATES

**increases as legislators appropriate millions for school aid and public buildings.**

Laws and regulations, pending or passed in State Legislatures, will have a direct bearing on school and institutional building, industrial development, smoke control, fuel regulation, building codes and other factors affecting heating, ventilating, and air conditioning industries.

Legislation designed to facilitate the financing of school construction through new, increased or extended state aid or liberalization of local debt and tax restrictions has been enacted thus far this year by a dozen states, with similar measures pending in a number of others.

Increased amounts for construction of new and expanded state institutions, state office buildings and other publicly-owned structures were made available on a wide scale by state legislative sessions throughout the country this year, accompanied by broadened resort to bond issuance to finance such projects.

• **CONNECTICUT.**—Legislature authorized bond issues in the amount of $10 million to finance a building program at state welfare, health and humane institutions; $2 million for construction at the University of Connecticut; $550,000 for teachers' college construction; $920,000 for vocational school building construction, and $1,750,000 for expansion of the State Office Building and other purposes.

• **DELAWARE.**—Pending legislation calls for a $17,425,684 state bond issue to aid in financing school construction in 41 districts. The state funds would be used with local funds raised in 25 of the districts and totaling $5,966,450 for a grand total of $23,392,140 worth of construction.

In addition to projects covered by the general appropriations act, the Florida solons also authorized a special appropriation of $5 million for the start of a new medical college at the University of Florida.

• **GEORGIA.**—Legislature created a State Office Building Authority to build a $10 million state office building.

State School Building Authority, created in 1951 to finance school construction through revenue bonds amortized from rentals paid by local school boards for use of the buildings, is carrying out a program aimed at "equalizing" public school facilities at an estimated total cost of $140 million. An initial bond issue of $32 million took care of the building needs in 29 city and county school systems, with a pending $66 million issue expected to equalize facilities of another 77 school systems.

• **ILLINOIS.**—A new law provides for construction of a new $12.5 million state office building in Springfield.

A series of bills passed by the Illinois Senate (June 18) and sent to the House would set up a seven-member State Building Authority to plan and construct state buildings with legislative approval and to issue revenue bonds to finance them.

• **INDIANA.**—Legislature enacted a bill to allow lending from the $26 million state common school fund to local school corporations to finance the construction of school buildings.

• **KANSAS.**—Will launch the biggest state building program in its history during the biennium starting July 1, according to recent announcement by State Architect John Brown. He said a total of $29,124,489 will be available during the two-year period for construction projects, including a new $9 million state office building.

• **MARYLAND.**—Legislature enacted a bill providing an additional $20 million credit pool for school construction. Legislature enacted a bill authorizing issuance of $15,040,050 in bonds for state institutional and related building projects. Biggest share of the new capital improvements program will be allotted to the state's crowded penal institutions. Other allocations include nearly $2 million for University of Maryland projects.

Under previously granted state bonding authority, plans are proceeding for the construction of a new $10 million stated office building in Baltimore and a $3 million state office building in Annapolis.

• **MASSACHUSETTS.**—Several proposals for the construction of a new state office building in Boston were submitted to the legislature, with the issue still pending at this writing. One proposal called for a new $30 million structure, providing more than 1,000,000 cubic feet of office space for various state agencies now scattered throughout Greater Boston.

New Jersey State Supreme Court recently ruled that the State Building Authority's acquisition of property and leases of such property to the state constituted a violation of the debt limitation provision of the state constitution. The authority had been planning building projects totaling some $30 million, for financing under a revenue bond plan.

• **NORTH CAROLINA.**—Legislature enacted a bill authorizing a new $50 million school building bond issue, subject to approval at an election to be called by the governor. If approved by the voters, the bond funds will be used for additional grants-in-aid for local schools.

A new state building code for North Carolina, which will make possible the use in the state of new materials, designs, methods and procedures, has been adopted (June 19) by the State Building Code Council.

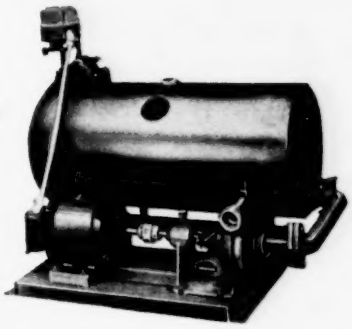
Bills enacted by the legislature authorized bond issues of $22 million for improvement at mental hospitals and $14,250,000 for construction work at other state institutions. The mental hospital bond issue will be subject to approval at an election to be called by the governor.

Ohio's State Public Utilities Commission rejected (May 19) a request by the Ohio Fuel Gas Co., for a complete freeze on additional space heating equipment in the 361 communities it serves.

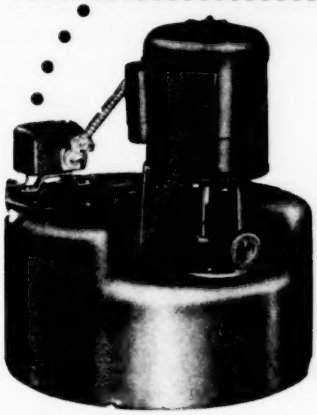
• **SOUTH CAROLINA.**—Legislature enacted a bill increasing $8.3 to $13.3 million the amount of state aid to counties for school buildings.

# Skidmore Pumps...

## ...a long record of dependable performance



TYPE HS PUMP
Capacities range from 1,000 to 65,000 sq. ft. E.D.R.



TYPE CV PUMP
Capacities range from 500 to 10,000 sq. ft. E.D.R.

Skidmore has pioneered the manufacturing of quality heating pumps for over a quarter of a century . . . by continual research and development throughout this period, SKIDMORE has set a precedent in the heating pump field for *performance* and *dependability*. There is a SKIDMORE heating pump for each and every heating installation . . . for complete information, see your SKIDMORE representative or write to factory.

**SKIDMORE CORPORATION**
ST. JOSEPH, MICHIGAN

## A wide choice of
# SPRAY NOZZLES
## for heating & ventilating systems

Whatever the application...humidifying, atomizing, cooling or others...Binks offers you one of the most complete selections of spray nozzles produced anywhere...and each nozzle is specifically designed for the service intended.

You get fine fluid break-up with minimum pressure. No internal restrictions to restrict flow. You get long nozzle life. Heaviest metal cross-section at points of greatest erosion. You have a choice of nozzles cast or machined from brass or special corrosion-resistant metals. For complete data, write Binks Manufacturing Co., 3120-38 Carroll Ave., Chicago 12. Or mail coupon.

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*EVERYTHING FOR WATER COOLING*

**Send for helpful Nozzle Catalog**

40-page Catalog 5200 contains dimensions, spray angles, capacities, cutaway drawings...in fact, every*thing* you need for nozzle specification or selection. And it's FREE...just mail coupon.




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**Binks Manufacturing Company**
3120-38 Carroll Ave., Chicago 12, Ill.
Gentlemen: Please rush me a FREE copy of your Spray Nozzle Catalog 5200.

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A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

REPRESENTATIVES IN ALL PRINCIPAL CITIES • SEE YOUR CLASSIFIED PHONE DIRECTORY

# GET MORE OUT OF YOUR SPRAYING EQUIPMENT WITH LESS POWER

For spraying, washing, rinsing, cooling and air conditioning, Yarway Spray Nozzles will improve the efficiency of your spray equipment.

There are no internal vanes or other restrictions to clog or hinder the flow.

Cast bronze Involute-type

Bar stock Involute-type

Bar stock Fan-spray-type

Yarway Spray Nozzles are available in two types—the Yarway Involute producing fine hollow cone spray with minimum energy loss, and the Yarway Fan-spray for flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Made of metal castings or machined from solid bar stock.

The 20-page Yarway Spray Nozzle Bulletin contains not only complete details on Yarway Spray Nozzles and Fittings, but also much helpful information on the many uses for spray nozzles. Ask for a free copy—Bulletin N-617.

YARNALL-WARING COMPANY

104 Mermaid Ave., Philadelphia 18, Pa.

YARWAY / spray nozzles




## NDHA CONVENTION

**held at Lookout Mountain, Tenn. Many interesting papers and reports presented.**

Charles W. Deeg, manager, Industrial and Commercial Development Division, Philadelphia Steam Company, was elected president of the National District Heating Association at its forty-fourth annual meeting held at Lookout Mountain Hotel, Lookout Mountain, Tennessee, June 9 to 12. About 200 members and guests were present.

Papers and panel discussions covered air conditioning with steam, air pol'ution control, piping, corrosion and others of special interest. The annual address was given by the president, Percy A. Hyde, Ohio Edison Co.

• **NEW OFFICERS.**—In addition to President Charles W. Deeg, the new officers elected include Thomas P. Brown, Jr., Consolidated Edison Company of New York, Inc., first vice-president; Leo F. Collins, Central Heating Department, The Detroit Edison Co., second vice-president; Vernon J. Suche, Union Electric Company of Missouri, St. Louis, Mo., third vice-president; John F. Collins, Jr., secretary-treasurer. J. Earl Seiter, Consolidated Gas Electric Light and Power Co. of Baltimore, Baltimore, Md., was made an honorary member of the association.

## I-B-R SCHOOL

**reports increasing interest during three years of growth. Advanced course to be developed.**

A total of 6,900 students have attended the I-B-R School of Modern Heating since it was started in April, 1950. Exactly 130 school sessions have been held with an average attendance of 54, although the average for 1953 is 61 students. Arthur L. Wales, field training director, has traveled 250,000 miles from Boston to Ames, Iowa, and from Jacksonville, Florida, to Minneapolis, Minnesota.

• **GROWTH.**—Indicative of the popularity of the schools is the fact that in all cities where the school has been held more than once, the attendance the second time has exceeded the first, and subsequent schools have exceeded all previous schools in attendance. In five cities there have been four schools with the attendance at the fourth school marking a new record.

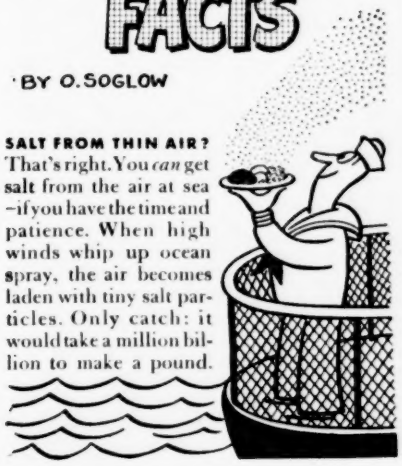
Because of the popularity of the schools the Field Training Committee has voted to employ a second instructor. Mr. Wales then will be left free to develop material for an advanced course in hot water and steam heating systems.

• **ADVANCED COURSE.**—It is proposed to cover in the advanced course larger commercial structures such as motels, garages, and small apartment buildings larger than one-family residences. The proposed advance course is not intended to invade the field of the heating engineer,

(*Continued on page* 136)

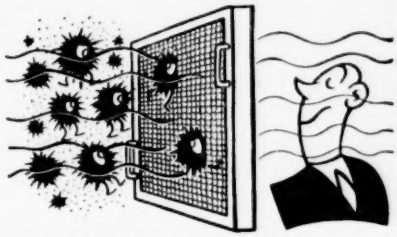
# AIR-MAZING FACTS

BY O. SOGLOW



**SALT FROM THIN AIR?** That's right. You *can* get salt from the air at sea—if you have the time and patience. When high winds whip up ocean spray, the air becomes laden with tiny salt particles. Only catch: it would take a million billion to make a pound.

**SOUND IDEA FOR DIESELS.** Noisy diesel air intakes cause employee fatigue and annoy neighbors. But Air-Maze filter-silencers hush the racket while they clean the air.



**BAD AIR GETS FRESH START!** Air-Maze panel filters keep damaging dust and grit out of engine rooms, diesel locomotive cabs, offices, etc. They're all-metal, cleanable, have high dirt-holding capacity and low pressure drop. Available in a wide variety of types and sizes.

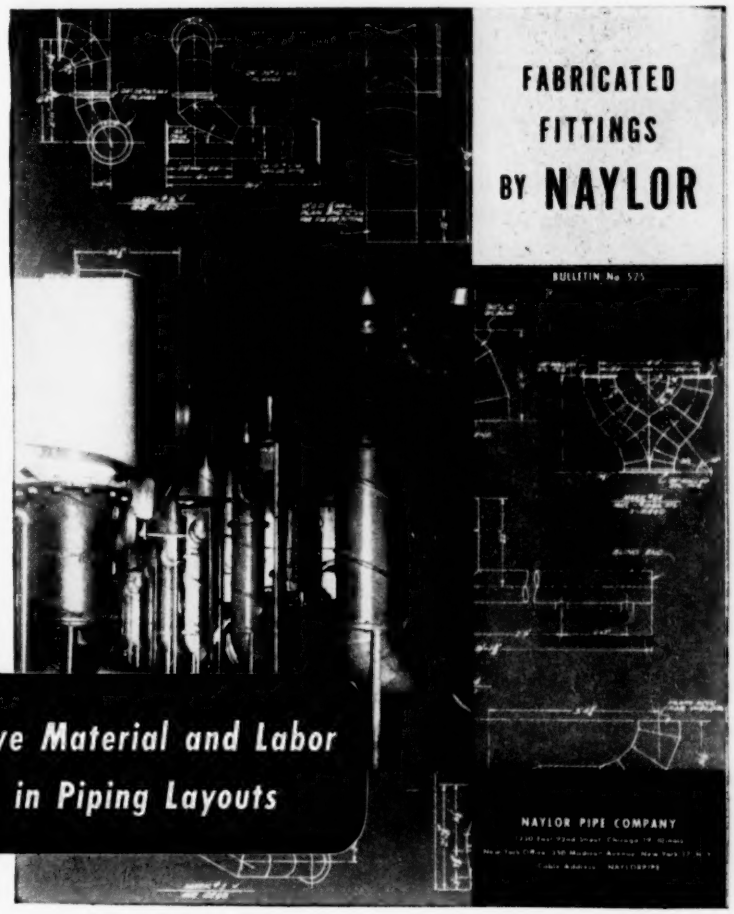
**WHETHER YOU BUILD OR USE** engines, compressors, air-conditioning and ventilating equipment, *or any device using air or liquids*—the chances are there is an Air-Maze filter *engineered* to serve you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 28, Ohio.

**AIR-MAZE**
*The Filter Engineers*

AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

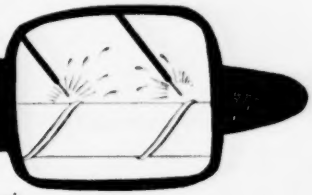


# Get this GUIDE to FABRICATED FITTINGS




*Save Material and Labor in Piping Layouts*

Write for this helpful bulletin on Naylor Fabrication Service. It presents data on standard and special fittings for lightweight pipe and offers practical ideas to simplify piping layouts. Included are special fabrications to save time, material and labor through eliminating numerous flanged joints and combining many fittings into one integral unit. Ask for Bulletin No. 525.



**NAYLOR PIPE**

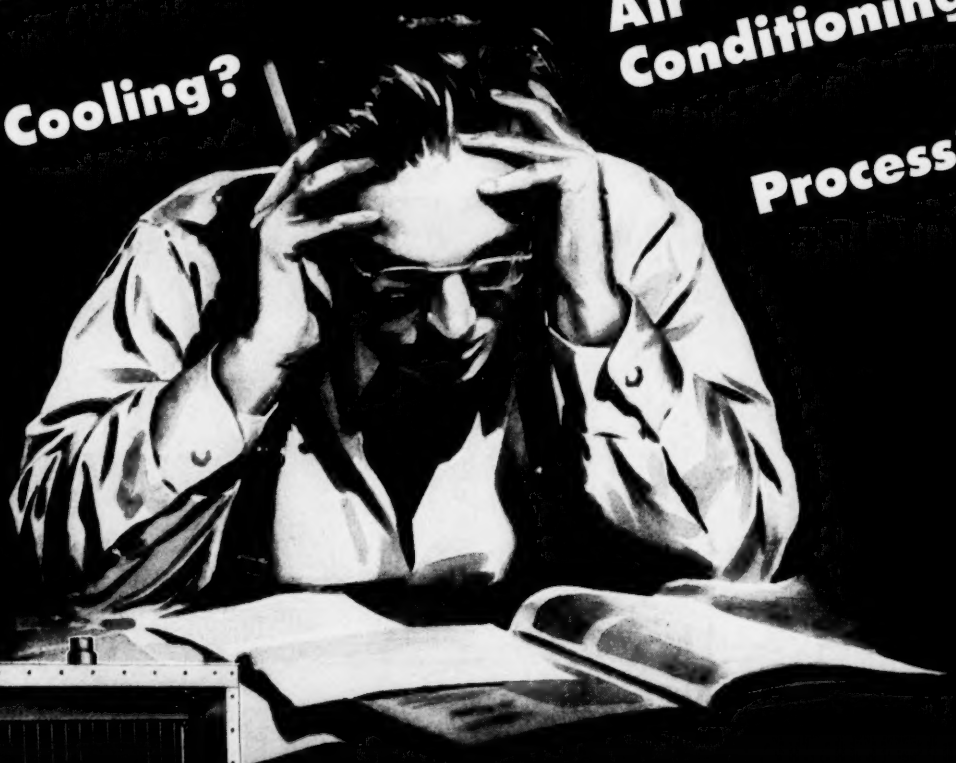
**NAYLOR PIPE COMPANY**
1265 East 92nd Street, Chicago 19, Illinois
*New York Office: 350 Madison Avenue, New York 17, New York*

Heating?

Cooling?

Air Conditioning?

Process?



## ASK THE AEROFIN MAN

*About Practical Heat Exchange*

There is a competent Aerofin heat-transfer engineer near you—qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem—and backed by the research and production facilities of the pioneers in light-weight extended surface.

Ask the Aerofin Man.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

AEROFIN CORPORATION

410 South Geddes St., Syracuse 1, N. Y.

# PRODUCT INFORMATION SERVICE

**Use the postage-free postcard below for further information on:**

- **News of Equipment and Materials**

**or a copy of the following**

- **New Catalogs**

**Circle the item Numbers in which you are interested and print clearly your name and address with title.**

## NEW CATALOGS

### FREE DECIMAL EQUIVALENT DECAL

A time saving decal showing decimal equivalents in 64ths is available from The Meyercord Co., Chicago, Ill. The complimentary decal is only 6 by 1¼ inches and is designed for application to slide rules, T-squares, drawing boards, desk tops and other similar drawing equipment. The figures are easy to read, printed in sharp black and red type on a white background. . . . . **Item 46**

### GAS AND GAS-OIL BURNERS

A four-page, three-color folder, Form 2359, on gas and dual-fuel firing for heating, processing, and power has been issued by Iron Fireman Mfg. Co., Cleveland, Ohio. Emphasis is laid on the advantages of zone fire control for low start and modulated firing permitted by the company's vertical gas burner, on the features of the inshot type of burner, on ring-type burners designed for intermediate and high pressure gas, and on the recently announced dual fuel (gas and oil) package unit combining the radiant gas burner with the gun-type commercial oil burner. . . . . **Item 47**

### HEATING AND COOLING COILS

Four technical bulletins describing its water, blast heat, refrigerant and steam distributing tube coil lines are issued by United States Air Conditioning Corp., Minneapolis, Minn. Bulletin 65C covers blast heat coils, designed for heating, drying, tempering and other applications where high or low pressure steam is the source of heat. Bulletin 66C presents a description and specifications of steam distributing tube coils, for use in heating applications where the steam supply is modulated. Bulletin 67C deals with extended surface coils for cooling and heating with water, while Bulletin 69C describes direct expansion coils for use with Freon or similiar refrigerants. . . . **Item 48**

### AIR FILTERS

A loose-leaf catalog on its line of Airsan air filters is available from Air Filter Corporation, Milwaukee, Wis. Catalog includes descriptive, tabular and technical data on air filters for average conditions, high velocity filters, filters for heavy duty, grease filters, and filter holding frames. . . . . **Item 49**

### MOTOR STARTERS

Size 0-3 across-the-line motor starters are described in a new eight-page bulletin No. 14B7132A, released by Allis Chalmers Mfg. Co., Milwaukee, Wis. It covers manual and magnetic types of starters, and combination and reversing starters as well as push button control stations. Operating arrangements are described and three types of enclosures — general purpose, water-tight, dust-tight, hazardous dust location, hazardous gas location and open type — are given. . . . . **Item 50**

### HEAT TRANSFER HOUSE ORGAN

Young Heat Transfer Topics is the title of a two-color external house organ published by Young Radiator Co., Racine, Wis. Purpose of this publication is to disseminate engineering information on existing and new installations. Published bi-monthly, it is offered free of charge to architects, heating contractors, builders and engineers, etc. . . . . **Item 51**

### PACKAGED AUTOMATIC BOILERS

Bulletin 1219 of Orr & Sembower, Inc., Reading, Pa., describes Powermaster packaged automatic boilers in seventeen sizes from 15 through 500 hp for steam process as well as steam and hot water heating service. It describes advantages of packaged automatic boilers, firing equipment for light and heavy oils as well as gas, gives detailed specifications on the boiler, burner, and control systems. A 350-hp unit has been added to the line. Typical installation photographs are reproduced. . . . . **Item 52**

### OIL BURNER CONTROLS

A 22-page, two-color bulletin, GED-1832, on automatic controls for domestic oil burners is announced by General Electric Co., Schenectady, N. Y. It contains photographs, descriptions, and diagrams of the controls; gives application, operation, specification, and mounting information; and provides ordering directions. The automatic heating control exchange plan is explained. Controls covered are: room thermostat, night setback switch, flame detector and companion master control, master control with bimetallic helix, combination fan and limit switch, temperature limit control, immersion temperature control, and steam pressure control. . . . . **Item 53**

### THERMOSTATIC SWITCH

An extremely accurate Tempswitch is covered in a new catalog issued by Scaico, Palmyra, N. J. Principal of operation is expanding tube housing with stationary internal parts. Snap action contacts can be supplied where desired. This switch is used where an extremely sensitive control to temperature is required. . . **Item 54**

### DEAERATOR

A fresh approach to an old problem has resulted in a major design advance in boiler feed water deaerators. The Fred H. Schaub Engineering Co., Chicago, Ill., has issued Bulletin 575 which explains this engineering approach and the improved results achieved with its new Zero-Oxygen deaerator. This new design efficiently removes all oxygen and other noncondensible gases from feed water, thus advancing the life of the boiler, but the complete system integrates condensation recovery, deaeration, water storage and automatic boiler feeding into a single balanced system. . . . . **Item 55**

### CENTRIFUGAL PUMPS

Bulletin W-300-B4 covering its line of standard end suction centrifugal pumps is offered by Worthington Corp., Harrison, N. J. These pumps provide an over-all line of centrifugal pumps covering the widest variety of applications and offering maximum interchangeability of parts. The line covers six types of pumps with varieties of mountings, frames and drives. . . . . **Item 56**

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

**BUSINESS REPLY CARD**

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING
148 LAFAYETTE STREET
NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

### STEAM GENERATORS

An eight-page illustrated catalog devoted to its water tube steam generators has been issued by Superior Combustion Industries, Inc., New York, N. Y. Data and specifications for factory assembled units in nine sizes ranging from 5,300 to 33,000 lb of steam per hour; for pressures up to 400 p.s.i., designed to provide fully automatic firing with oil, gas, or stoker-fired coal. . . . . **Item 57**

### INDUSTRIAL BLOWERS

Bulletin A932 has been issued by Air Appliance Division, U. S. Hoffman Machinery Corp., New York, N. Y., describing its multistage centrifugal blowers and exhausters. These are built for applications requiring air pressures from 1 to 9 pounds per square inch or vacuum from 2 to 12 inches of mercury. . . . . **Item 58**

### RADIANT HEATING

A 20-page booklet on Radiant Hot Water Heating, Form CB-155, is issued by Weil-McLain Co., Michigan City, Ind. This book has been designed for use by heating contractors as a consumer sales tool. It explains to prospective home builders how radiant hot water heating fulfills the three primary requisites for heating comfort. Other important features of hot water heating, such as domestic water heating and snow melting, are outlined. The book is illustrated throughout in full color with diagrams for easy understanding of the principles of radiant heating. . . . . **Item 59**

### GAS FIRED APPLIANCES

A complete set of direct mail pieces for use by its jobbers and dealers is available from Roberts-Gordon Appliance Corp., Buffalo, N. Y. The campaign includes separate pieces on the company's Gordoneer, new hot water wet-base boiler, gas fired winter air conditioners, conversion gas burner, gas-fired unit heater and a four-color cross section of the operation of the conventional gas burner compared with the company's Spreader Flame gas burner. . . . . **Item 60**

### HEAT PUMP

An illustrated booklet which shows how the company's heat pump can help the architect or builder design his homes, is published by General Electric Co., Heat Pump Dept., Bloomfield, N. J. Called the Architect's Guide To The General Electric Heat Pump, the booklet graphically tells how the all-electric year-round air conditioner permits unusual design flexibility. It describes the advantages of the heat pump, how it fits into a variety of architectural plans, and contains application hints and a question and answer section on the heat pump, as well as other features. . . . . **Item 61**

### AIR FILTER TESTER

Price list DP-01 on the Dill dust-spot tester has been issued by Trion, Inc., McKees Rocks, Pa. It is accompanied by a four-page folder describing this tester which is an instrument for measurement of air filter efficiency. . . . . **Item 62**

### PACKAGED BOILERS

A four-page, illustrated booklet describing its line of Continental automatic boilers is issued by Boiler Engineering & Supply Company, Phoenixville, Pa. In addition to containing detailed engineering data and specifications, the booklet also discusses the features and advantages of these boilers which range in size from 20 to 500 hp. Two-pass design eliminates baffles. Clean-out-and-inspection doors on both ends are hinged and can be opened by one man in 30 minutes. The only refractory used is for the lining of the easily-removable front and rear covers. . . . . **Item 63**

### OIL-BURNING SYSTEMS

A four-page two-color bulletin on series of complete oil-burning systems that the company has installed in and around metropolitan New York, is issued by Peabody Engineering Corp., New York, N. Y. While not detailed, the bulletin does give interesting before and after pictures of several installations. . . **Item 64**

### SHOWER HEADS

A four-page folder has been issued by Sloan Valve Co., Chicago, Ill., devoted to its Act-O-Matic shower head. Models AC10 and AC61, with and without volume control, respectively, have been on the market for several years. Two new models AC100 and AC110 have been added to the line to fill the need for a self-cleaning shower head for institutional showers. . . . . **Item 65**

### MULTI-PURPOSE CEILING

A Performance Curves report on its multi-purpose ceiling which provides radiant heating, radiant cooling and acoustical control, has been prepared by the Architectural Products Div., Burgess-Manning Co., Chicago, Ill. This study, particularly useful to engineers, contains nine full-page graphs. The graphs show heating capacity curves for the ceiling for combined radiation and natural convection, effective ceiling panel surface temperature, calculated upward heat flow, and other information revealing performance. . . . . **Item 66**

### BASEBOARD RADIATORS

A 12-page brochure is available from Waterfilm Boilers, Inc., Jersey City, N. J., describing and illustrating its new line of Koven Trimrad baseboard radiators. Complete information is furnished on the features of this baseboard which has three large water-ways holding 1.1 quarts of hot water per linear foot and is of welded steel construction. Details are also included on how to figure the system, along with a table of capacities; typical baseboard layouts for different types of homes; typical piping layouts; roughing-in dimensions; and detailed, step-by-step instructions for installing the baseboards for recessed or standard mounting. . . . . **Item 67**

### STRAPPING FOR PIPE INSULATION

Advantages of fastening pipe insulation with steel strapping is explained in a bulletin by Acme Steel Co., Chicago, Ill. entitled Steel Strapping Fastens Insulation Firmly (Bulletin Ad 20) describes how steel strapping tensions evenly around insulation, keeps seams tight, helps to prevent formation of destructive moisture and speeds up difficult jobs without cutting into or marring insulation. Type of strapping most suitable for each particular job is also explained. Size, weight and type of steel strapping are shown in table form. Line drawings illustrate the many models of stretchers and sealers available. . . . . **Item 68**

### WELDING FITTING CUTTER

Bulletin FC-8 has been issued by Vernon Tool Co., Ltd., Alhambra, Calif., describing its Universal flame cutter for cutting new and used welding fittings. This device cuts ells to any angle, shortens welding fittings, miters them, recuts and bevels used fittings, and similar operations, and may be used on fittings from 2 inches inside to 24 inches outside diameter. . . . . **Item 69**

### UNIT HEATERS

Form A365, a catalog of 16 pages, has been published by United States Radiator Corp., Detroit, Mich., devoted to its line of steam and hot water unit heaters. . . . . **Item 70**

### BLOWER WHEELS

A 20-page catalog has been published by Revcor, Chicago, Ill. and covering its comprehensive line of blower wheels. Catalog gives complete engineering data on each size of the line which covers diameters from 1½ to 12⅜ inches in single and double inlet. Complete engineering data are included. Catalog also includes descriptive material on the company's sheet metal housings, and cost data on correct scroll dimensional data on the housings required for the blower wheels. . . . . **Item 71**

### ELECTRIC WATER HEATERS

Price List 89E has been issued by Pennsylvania Range Boiler Co., Philadelphia, Pa., and devoted to its line of Bradford automatic electric water heaters available, in round models and table top models. Price sheets are also available from the same company on its galvanized range boilers and its painted basement expansion tanks. . . . . **Item 72**

### HARD SURFACING

Bulletin 644, 20 pages, is issued by The Lincoln Electric Co., Cleveland, Ohio, under the title Weldirectory for Hard Surfacing. The booklet is a handbook or manual on the building up of hard surfaces by use of electric welding. . . **Item 73**

**PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | | | | | | | |

Aug. H-53

PLEASE PRINT

Name . . . . . .

Title . . . . . .

Firm . . . . . .

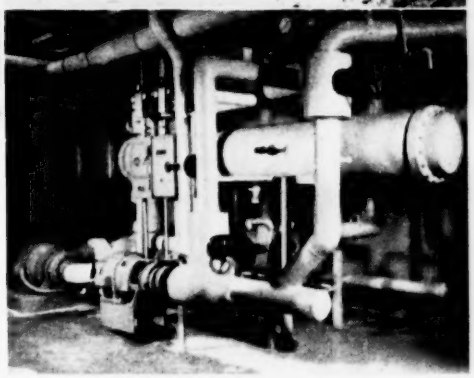
Nature of Firm's Business . . . . . .

Street . . . . . .

City . . . . . Zone . . . . State . . . . .

This card is void after Nov. 1, 1953

Melting snow automatically is the job of this compact installation, placed in a basement corner of the John Hancock building.



## p-k *insures* John Hancock *against snow underfoot*

Slippery, icy, snow-covered sidewalks are a thing of the past at John Hancock Mutual Life Insurance Company in Boston. Tubing permanently embedded in the sidewalk carries ethelyene glycol solution, heated by a **p-k** snow melting converter. Snow is melted as it falls and drains away.

The **p-k** snow melting converter at John Hancock has capacity to heat 225 gpm of 50% ethelyene glycol solution from 160°F to 180°F with steam at 40 psig., using 976 feet of ¾ in. 18 gauge copper tubing. The system was designed and installed by Buerkel and Company, Inc., Boston contracting engineers.

Like the John Hancock Company, you will find sidewalk heating a means of promoting goodwill and increasing foot traffic. At the same time you get *insurance* against damage suits resulting from slippery sidewalks, plus definite snow removal time and labor savings. Write **p-k** now for information on snow melting equipment or any heat exchange problem.

**the Patterson-Kelley Co., inc.**

980 Burson St., East Stroudsburg, Penn.

1971

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

# Panqborn

UNUSUAL OPPORTUNITIES FOR

## DUST CONTROL ENGINEERS IN RAPIDLY EXPANDING FIELD WITH ESTABLISHED TOP RATED ORGANIZATION

### • DESIGN and DEVELOPMENT ENGINEER

Design and Development Engineer experienced in dust handling systems, design of industrial dust and fume control and collecting equipment. Position requires initiative, technical ability and experience to develop, design and test practical, marketable equipment; from his ideas and those of others. Must have successful record designing industrial equipment.

### • APPLICATION ENGINEER

To survey and study industrial plant conditions, prepare recommendations for dust and fume control including system design, layout and calculation, equipment selection, cost estimates. To establish application engineering practices on control systems and equipment. Investigate new application fields. Duties involve some field work.

### • EXPERIMENTAL and TEST ENGINEER

For laboratory and field experimental and test work on industrial dusts and fumes and control equipment. Experience in air flow testing, dust sampling and counting, particle size analysis and industrial hygiene preferable. Some field test work. Prefer graduate engineer with laboratory or industrial experience in similar work.

*Excellent working conditions; paid vacation and holidays; group life insurance; sickness and accident benefits; employee's profit sharing plan; family hospitalization and surgical plan. Good schools and ideal suburban living.*

*Replies confidential. State education, experience, age, expected starting salary.*

*Please address*

**Mr. W. O. Vedder, Mgr., Dust Control Dept.**

**Panqborn CORPORATION**

HAGERSTOWN, MARYLAND




## I-B-R SCHOOL

(*Continued from page* 132)

but will be designed to provide information to the average heating contractor who is called on to design systems for these types of buildings.

• **SCHEDULE.**—Starting in August, the I-B-R School of Modern Heating moves west for several months with schools in Seattle, Washington; Portland, Oregon; San Francisco, California; Denver, Colorado; and Lincoln, Nebraska. In September and October there will be two schools in Canada sponsored by Canadian members of The Institute of Boiler and Radiator Manufacturers and by the Canadian Plumbing and Heating Institute.

## CONSTRUCTION

**continues toward all-time record high as five month total in contracts gains 8% lead over 1952.**

The construction boom in the 37 states east of the Rockies continued to spiral towards a 1953 all-time record in contracts awarded as five month totals gave the current year an 8% edge over 1952, it was reported by F. W. Dodge Corp. The five-month 1953 figure was $6,792,329,000 according to Dodge Reports totals.

• **YEAR.**—Nonresidential building for five months showed the greatest increase over 1952 with a $2,492,801,000 total which was up 16%. Residential awards at $2,795,412,000 was up 1%. Heavy engineering (public works and utilities) at $1,504,116,000 was up 11%.

• **MAY.**—The Dodge Reports construction total for May was $1,606,091,000 or 8% behind April but 3% ahead of May, 1952. Individual May awards showed nonresidential contracts of $582,061,000 down 15% from April but up 26% over May last year. Residential awards of $637,721,000 were 5% less than April and 15% less than May, 1952. Heavy engineering at $386,309,000 was less than 1% below April and was 11% above May a year ago.

## LOW-RANK COALS

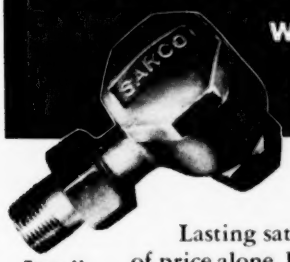
**may be exploited by new process for utilizing western lignite. Texas plant to generate power for smelter.**

A process for utilizing the vast lignite and subbituminous coal reserves of the American west as a source of cheap electric power and coal tar products is described in detail for the first time in a Bureau of Mines report released by Secretary of the Interior Douglas McKay.

Based on the Bureau's experimentation, the Texas Power & Light Co. is building a central electric powerplant in Milam County, Texas, that can use Texas lignite and also provide for Alcoa's new aluminum-smelting plant, opened in November 1952. Fuel derived by this process is expected to compete with natural gas at pre-

(*Continued on page* 138)

TWENTY YEARS WITHOUT REPLACEMENT




Type H

Lasting satisfaction is not a matter of price alone. It is much more a matter of faultless design, superior materials and expert workmanship.

If you want to be proud of the job, if you want to build reputation, specify SARCO RADIATOR TRAPS. They are built to last.

SARCO makes a complete line of quality specialties for steam and hot water heating. Full information in Catalog 201.

WRITE FOR YOUR FREE COPY TODAY

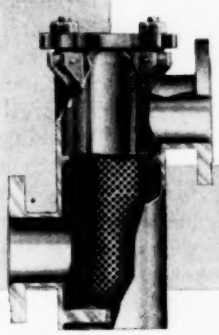
SARCO COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N. Y.

Represented in Principal Cities
SARCO CANADA LTD., TORONTO 5, ONTARIO

509

USE ADSCO

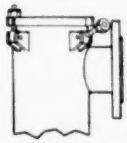


S-Type ADSCO Strainers screen out foreign matter from oil, water, and other liquid lines. Damage to valuable equipment is prevented. Usually installed on suction side but can also be used for discharge or other services.

S-TYPE

STYLE B COVER

Toggle and Bolt Type



Cover held in place by toggle bolts. This design simplifies removal of cover while cleaning basket screen. In sizes from 4" to 12", for pressures to 50 psi.

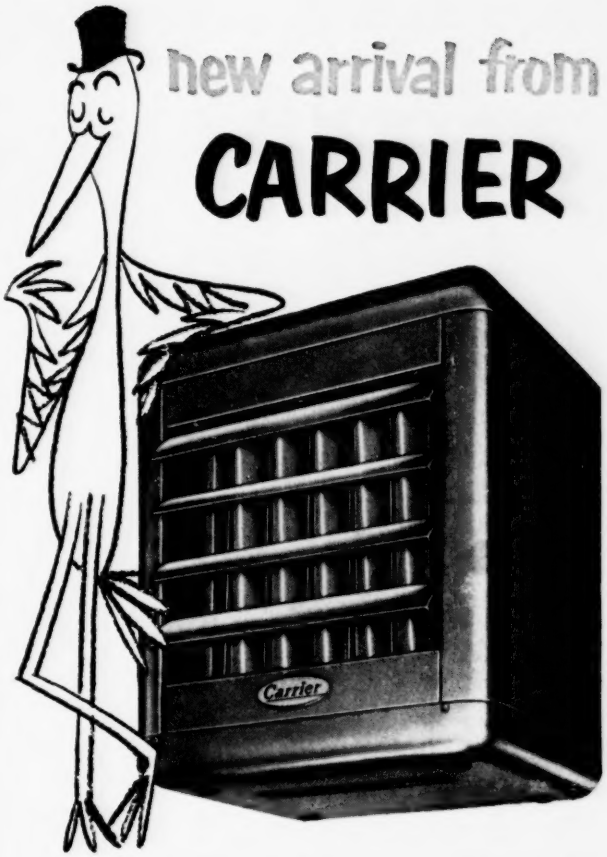
STRAINERS

AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA NEW YORK

Since 1877

new arrival from CARRIER




...a small-package gas-fired Unit Heater with lusty lungs

It is only 2" high—yet it has a capacity of 58,000 Btu's per hour

**COMPACTNESS** is its special asset. It opens a vast additional market. It provides directional space heating (with space saving) facilities, available to thousands of low-ceiling stores, garages, service stations, diners, vestibules, entrances, etc.

**SIMPLICITY** is the key to its compactness. Gas is fired directly in the tubes of the leakproof one-piece heat exchanger, resulting in maximum heat transfer. *16* gauge ALUMINIZED STEEL is used for this one-piece heat exchanger. This *exclusive* Carrier feature adds years of service. Gas and fan shutoffs are completely automatic.

**CARRIER GAS-FIRED UNIT HEATER 46T50** is typically Carrier engineered, handsomely styled, exceptionally quiet in operation and sturdily constructed. It is AGA-approved for all types of gas.

**CARRIER GAS-FIRED UNIT HEATERS** come in both propeller-fan and duct types, in 7 additional sizes up to 230,000 Btu's. For further information on these, as well as on the new model described above, write to Carrier Corporation, Syracuse, New York.

Carrier

AIR CONDITIONING · REFRIGERATION · INDUSTRIAL HEATING

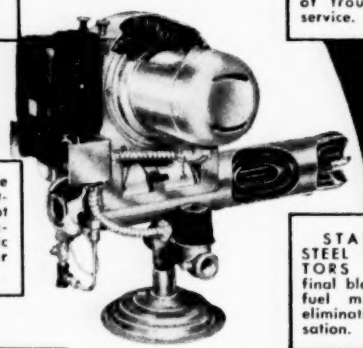
The "Inside Story" of
SIEMON Power-Flame SUPERIORITY

Power-Flame units (all models) are shipped completely assembled with controls wired. Just connect power and gas lines.

Quiet, amply-sized blowers provide balanced air mixture for very high heating plant efficiency.

Controls burner mounted and tested. Installation cost reduced to a minimum.

Motors amply-sized and properly applied bring to Siemon users a lifetime of trouble-free service.



Lighting made easy. Push button runner pilot on smaller capacities. Electric ignition on larger models.

STAINLESS STEEL DEFLECTORS provide final blending of fuel mixture — eliminating pulsation.

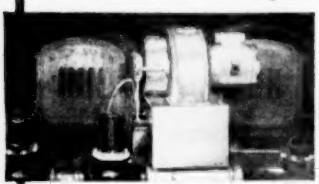
Balanced air adjustment. Precision built to provide metered air for complete combustion.

"Tube within a Tube" design. A Siemon exclusive means quietness and very high efficiency.

**The GAS Conversion Burner**

*Engineered for "Hard to Fire" Applications*

Forced-draft design reduces to a minimum the problem of natural drafts. Perfect intermixing of air and gas results in real fuel saving. Highly efficient in down-draft heating plants. Gun-type design permits installation in a minimum of space.



Models in capacities from 85,000 to 3,000,000 B.T.U. input. All units are completely packaged and gun-type design installation costs reduced to a minimum.

Another example of Power-Flame versatility. This installation made over a coal stoker.

**You owe it to yourself** to get the facts about Siemon's "profit plan." Write today for literature and information about Power-Flame Gas Conversion Burners.

Siemon Power-Flame BURNER

**Siemon Manufacturing Co.**
1819 Holmes
Kansas City, Missouri




## LOW RANK COALS

(*Continued from page* 136)

vailing prices. It will be about a year however, before the Alcoa plant begins drawing on the new power source.

• **PROCESS.**—Known as coal carbonization in a fluidized state, the process represents two years of research by the Bureau of Mines in cooperation with the Texas Power & Light Co. Experimentation was carried out at the Bureau's pilot plant in Denver, Colo.

The major object of the Bureau's investigation—conducted from 1949 through 1950—was to develop a technology for carbonizing lower rank western coals so that valuable tars, source of many basic chemicals, could be separated from their residue. The charred residue, however, acts as the boiler fuel that can be used eventually to produc thermal electric power. The report deals largely with a description of this process. It also gives basic details data on the processing of 11 typical fuels, all low-rank and noncoking.

• **RESOURCES.**—The Bureau's research on lignite is part of its overall program of expanding the use of these low-rank, noncoking western coals—a program greatly accelerated during World War II. Lignite is significant as a fuel because it is near the surface, is cheap and abundant—an estimated 712 billion tons of it, and is about one-half the total coal reserves of the West. The other half is subbituminous; also usable in this process.

As a result of the Bureau's process, however, a new horizon has been opened up, making lignite and subbituminous coal commercially promising on a large scale. Often called "fluidized carbonization," the new process is a variation of low-temperature carbonization and yields a char of high heating value for powerplant use, crude primary coal tar, and is a possible future source of by-products such as drugs, dyes, plastics and explosives—products which now come from coke oven tar.

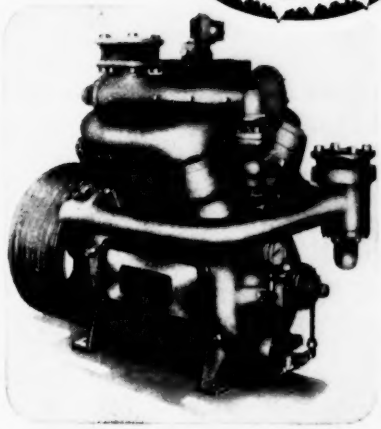
• **MOISTURE.**—Earlier Bureau reports on experimental work conducted at Denver describe the theory and practice of removing inherent moisture from lower rank coals, but did not include a study of how surface moisture is removed from the fine fuel. This report deals largely with carbonizing fine coal after drying, and gives results of pilot-plant investigations on low-temperature carbonization of several typical noncoking fuels.

Fluidized, or entrained, drying is merely a process of mixing fine coal with hot gases in such proportions that the resultant mixture reaches a temperature of 275F to 325F. After the coal has been in this environment long enough, 90 to 95% of the inherent moisture is evaporated. This takes approximately 50 seconds, according to the report. The velocity of the gas and the size of the drying chamber are other important factors in drying.

• **PILOTS.**—To carry out the research, the Bureau developed two pilot plants in Denver—one of 5 tons-per-day capacity and a large integrated unit of 25 tons-a-day capacity, where the drying and carbonizing operation is run in sequence. The report is chiefly concerned with the work on the small unit, used to experiment on more sources of typical western coals. The commercial powerplant now being built in Texas will use about 1,000 tons

(*Continued on page* 140)

# PILOTLESS BOMBERS MADE WITH FRICK AIR CONDITIONING



The Glenn L. Martin Company, builders of "Matador" bombers, "404" transports, and other famous planes, uses 27 Frick compressors for air conditioning and special cooling services in its great plant at Middle River, Md. These machines have been installed over a period of 16 years by the Paul J. Vincent Co., Frick Distributors in Baltimore.

For the last word in dependability and convenience, specify Frick air conditioning, refrigerating, ice making and quick freezing equipment. Let us quote on your cooling needs NOW.

Frick "ECLIPSE" Compressors Handle Air Conditioning Work with Extra Economy: ask for details.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

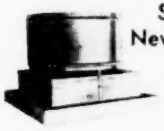
---

## Every COOK Fan Blade is *Individually* precision set

- All blades balanced and set to proper pitch for rated horsepower and CFM.
- Aluminum hub and blade, cast separately, machined and fitted with precision accuracy.
- Blade is securely locked to hub for long life and true pitch by taper pin bolt.

The cut-away photo above shows why rugged Cook Fans last longer and actually deliver their stated capacity. Each blade is individually set to the proper pitch for the rated horsepower and CFM. Thousands of Cook-built propellors have already proved their dependability.

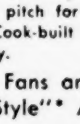
Sell Cook Industrial Fans and the New Cook "Chimney Style"* Attic Fan



Up-Blast Roof Ventilator in 16" to 48" sizes. Automatic dampers. Acid resistant coated, aluminum blades, up to 40,000 cfm output.

*Patent pending.

New "Chimney Style" Attic Fan saves attic space. Acid resistant coated steel chimney housing a direct drive fan. Easy to install, automatic dampers. Three sizes.



Cook Duct Fans. Direct or belt drive. Orifice 16" to 48". Ideal for spray booths.

Cook Type S Fans. Frame 24" to 48". Easy to install. Glass-insulated or explosion proof.

Portable Man-Cooler. Adjustable welded steel frame on rollers. Propellor 16" to 48".

COOK

Write for new catalog to Dept. HV, Loren Cook Co., Berea, Ohio

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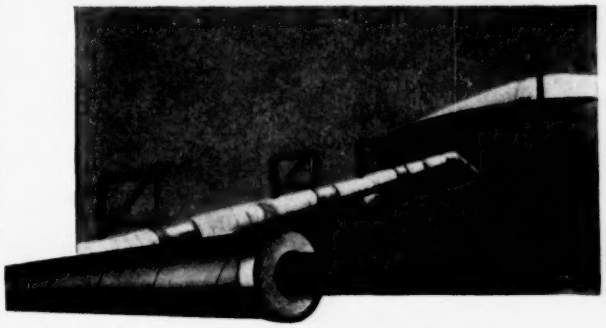
## RIC-WIL KEEPS THIS WATER LINE FROM FREEZING!



*Project: Water Works Improvement; Ishpeming, Michigan.*
*Consulting Engineer: Drury, McNamee & Porter; Ann Arbor, Michigan.*
*Contractor: L. W. Brumm; Marquette, Michigan.*

This overhead Ric-wiL pipe line, connecting an elevated storage tank to the distribution system, is protected from freezing even during winter temperatures as low as –40° F.!

For normal flow, ample thermal efficiency is assured by using 3" thick Fiberglas insulation, with a ¾" dia. steam tracer provided for stand-by use if required.

The 12" steel water line is coated on the inside with Ricwilite phenolic resin for corrosion resistance, and the entire prefabricated system is housed inside 21" dia. RIC-WIL HEL-COR Conduit for protection against the elements.

Ric-wiL PREFABRICATED INSULATED PIPING

UNDERGROUND OR OVERHEAD

THE RIC-WIL COMPANY · CLEVELAND, O.

TRUST YOUR future reputation to LAWLER CONTROLS!

**BAM Water Controller**

For group showers . . . hospitals . . . industrial purposes . . . single outlets . . . multi-outlets.

Lawler's "Performance-Tested" design combines pioneering experience with engineering leadership. The use of specially chosen metals assures YOUR customers years of positive, accurate temperature control with lowest maintenance cost . . . the best insurance YOUR REPUTATION can have!

Compare!

List the facts... Check them off... Lawler comes out first every time! YOUR REPUTATION is protected!

COMPARATIVE CHECK LIST

| LAWLER BAM WATER CONTROLLER | Product "A" | Product "B" |
|---|---|---|
| Most Complete Line ✓ | ✓ | |
| Hydraulic Thermostat ✓ | | ✓ |
| Polished Chrome ✓ | ✓ | |
| Non-Ferrous Construction ✓ | | ✓ |
| Loose Key Angle Stops ✓ | | |

The Lawler Line Thermostatic Controls

"Performance-Tested" for Longer Life

STEAM TEMPERATURE REGULATORS · SHOWER MIXING VALVES · WATER CONTROLLERS · TEMPERING VALVES

LAWLER AUTOMATIC CONTROLS, INC.

453 North MacQuesten Parkway Mount Vernon, New York




## LOW RANK COALS

(*Concluded from page* 138)

of lignite a day in each of nine units comprising the lignite processing part of that plant.

Prepared by V. F. Parry, chief of the Bureau's Coal Branch in Denver, W. S. Landers, fuel technologist, E. O. Wagner and J. B. Goodman, chemical engineers stationed at Denver, and G. C. Lammers, chemical engineer employed by the Texas Power & Light Co., the report contains results of assay tests on different coals tested. A chapter is devoted to chemical and physical properties of the products, including the tars. Several diagrams of the process supplement the report.

A free copy of Report of Investigations 4954, "Drying and Carbonization Fine Coal in the Entrained and Fluidized State," can be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

## ASRE MEETING

**at Lake Placid, N. Y., has largest mid-year attendance. Charters granted four new chapters.**

Approximately 700 members and guests took advantage of the beautiful surroundings of the Lake Placid Club, Lake Placid, N. Y., located in the heart of the Adirondacks, to participate in the semi-annual meeting of the American Society of Refrigerating Engineers, June 28 to July 1.

• **FUTURE.**—The welcome luncheon speaker, Clarence H. Linder, vice-president of engineering, General Electric Co., spoke on What the Future Holds for our Industry. Mr. Linder said:

"In the years immediately following the war, year-round air conditioning was talked about only among the engineers. Yet last year, about 25,000 systems were installed and there are those of us who believe a recent prediction that 60,000 homes will be equipped with complete air conditioning this year is more nearly a minimum figure.

"There is every evidence that the air-conditioning industry has the potential of becoming one of the fastest growing industries in the country during the next quarter of a century. I believe that the one billion-dollar industry which air conditioning is today can become more than a five billion-dollar business within ten years, if the product is good, and the price is right. But it is a tremendous challenge, and it puts a premium on the contributions engineering can and must make in design and technological improvements.

"How fast the heat pump will become a practical and accepted product will be determined by a number of factors, including power rates, the installed cost of the product, and the solution of technological problems related to heating and cooling capacities. The heat pump will consume more electric power than any other product in the home. Equally important, is that its future rests

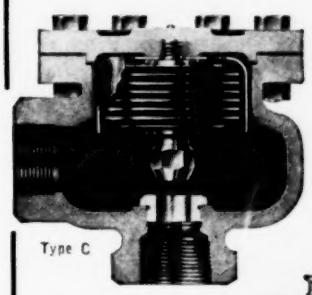
(*Continued on page* 142)

Nicholson Steam Traps

# CUT HEAT-UP TIME 48%

A large processor recently reduced the heating cycles of cookers from 1¾ hrs. to 50-60 min., by substituting Nicholson thermostatic steam traps for a mechanical type. This effected a gratifying production increase of 37%. Reasons for Nicholson's faster heat transfer: operates on lowest temperature differential; 2 to 6 times average drainage capacity; maximum air venting.

5 TYPES FOR EVERY APPLICATION, process, heat, power. Sizes, ¼" to 2"; press. to 250 lbs.



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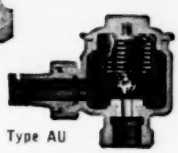

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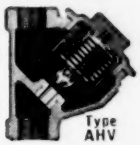

Type AHV

BULLETIN 853 or see Sweet's

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

199 Oregon St., Wilkes-Barre, Pa.

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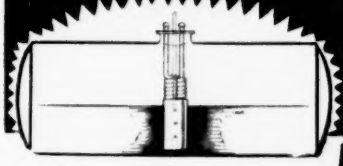
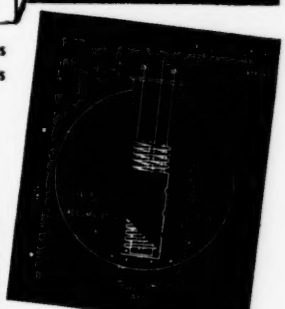
PREHEAT HEAVY OILS IN STORAGE TANKS

REMPE "Hot Spot" PREHEATER



Write for details and price

*Preheats fuel oils and other liquids to proper flow temperature before entering the suction line.*



**No. 5 and Bunker C oils flow more freely at high temperatures — have greater BTU value. The Rempe "Hot-Spot" does the preheating job efficiently. Takes the load off the suction pump. All-steel construction. Inlet and outlet pipes furnished in required lengths for any diameter tank. Steam or Hot Water can be used as heat source. Made with 14" or 16" diameter shell.**

*Complete facilities for fabrication of pipe coils—all types—all materials—engineering service. Send details for price.*

HEAT TRANSFER EQUIPMENT REMPE CO. Founded 1890

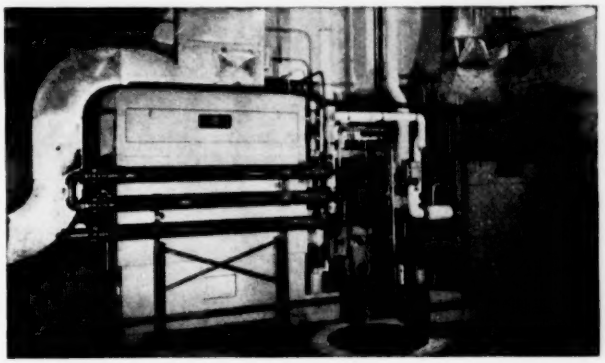
REMPE COMPANY

358 N. Sacramento Blvd., Chicago 12, Ill.

---

# This NEW METHOD DRIES AIR

## PRECISELY AS YOU WANT IT



## NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

***The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is***

**Best and most effective because . . .** it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

**Most reliable because . . .** the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

**Most flexible because . . .** you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

**Easiest to take care of because . . .** the apparatus is simple, parts are accessible, controls are trustworthy.

**Most compact,** taking less space for installation.

**Inexpensive to operate because . . .** no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

**The cleanest because . . .** no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

***For complete information write***

**NIAGARA BLOWER COMPANY**

*Over 35 Years of Service in Industrial Air Engineering*

Dept. HV, 405 Lexington Ave. New York 17, N. Y.

*Sales Engineers in Principal Cities of U. S. and Canada*

# greater efficiency for

## Commercial and Industrial

# GAS

## fired heating plants with

## field

## "M-G" draft controls

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provide simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases—resulting in greatly increased life.

**Now there is a Field Draft Control to provide for commercial gas-fired heating plants the same accurate, dependable, fuel-saving performance that has made Field first choice for oil and coal furnaces. The new Field "M-G" for gas is fully proven, widely accepted, fully safe — a control specially designed for gas but retaining all outstanding design features of the Field Type M Control. Write today for complete information.**

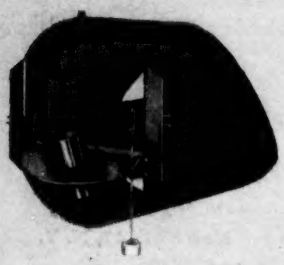
**FIELD CONTROL DIVISION**

of H. D. Conkey & Company — Mendota, Illinois

AFFILIATES: Conco Building Products, Inc.—Brick, Tile, Stone
Conco Materials Handling Division—Cranes, Hoists

**UP-DRAFT VIEW**

**Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.**



**DOWN-DRAFT VIEW**

**Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.**




## ASRE MEETING

(*Continued from page* 140)

primarily on how quickly the refrigeration engineer can design a low-cost unit which can be marketed at a price within the reach of all home buyers."

• **CONFERENCES.**—The popularity of the informal conference, one on packaged air conditioners and one on home freezers continued as in past conventions, and the papers presented were provocative of much discussion. The lead off paper at the air conditioner meeting was presented by E. H. Spiegel, president, National Association of Home Builders, Washington, D. C., who cautioned his listeners against allowing air conditioning to be considered as a sales gimmick.

The home freezer conference discussed the relative design features of the upright and chest types. At the regular technical sessions, twelve papers were presented of unusual interest covering a wide variety of subjects.

• **STANDARDS.**— In addition to the technical program, the Society approved two new standards: (1) The proposed American Standard on Rating and Testing Home Freezers, for which ASRE is the sponsor, and which has been "in the mill" for about ten years, and (2) a new ASRE standard on Rating and Testing Capillary Tubes.

ASRE Council also authorized the Standards Committee to proceed with the formulation of five new standards: (1) Designation of Refrigerants to Avoid the Use of Trade Names and Chemical Formulas; (2) Rating and Testing Cooling Towers; (3) Rating and Testing Beverage Coolers; (4) Rating and Testing Dehumidifiers; (5) Rating and Testing Bulk and Can Type Milk Coolers. Council, in addition, authorized a survey of industry to determine what use is being made of ASRE Standards.

Section charters were granted to groups in Houston, Texas, Memphis, Tenn., Louisville, Ky., and Dayton, Ohio. This brings the total of sections up to 35.

The next meeting of the Society will be held at the Shoreham Hotel, Washington, D. C., December 6-8, 1953, and the mid-year meeting in Seattle in July, 1954.

## F. E. GIESECKE

• Dr. Frederick E. Giesecke of New Braunfels, Texas, died on June 27, in his 84th year. A past president and life member of ASHVE, Dr. Giesecke was distinguished for his researches in the fields of hot water heating, heat transmission and air conditioning for comfort. He was also considered an expert on radiant heating methods. Dr. Giesecke was born in Washington County, Texas, in 1869, and received his preparatory education in the New Braunfels and San Antonio schools. He began his professional career at the A. and M. College of Texas, College Station Texas, from which he received his M.E. in 1890. In 1904 he received a degree of S.D. from the Massachusetts Institute of Technology, and from 1886 to 1912 he was a teacher at the Texas A. and M. College.

(*Continued on page* 144)

# HEATING AND VENTILATING'S

# *Ad-Digest* SERVICE

## A new service for readers of HEATING AND VENTILATING

**Below and on the following pages are given brief digests of the advertisements appearing in this month's issue of HEATING AND VENTILATING. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.**

NOTE: While every attempt is made to list all the advertisements appearing in HEATING AND VENTILATING, we cannot guarantee including those which are received after our published closing date. The Index of Advertisers lists all the advertisements in this issue.

**COPPER TUBE.** Page 36. Lightweight easy to handle corrosion resistant copper water tube gives a full flow of rust-free water and is recommended for hot and cold water, radiant heating, and drainage lines. ----------Item 201

**GAS UNIT HEATER.** Page 137. A new packaged gas fired unit heater 23 inches high with a capacity of 58,000 Btu per hour, one of a line of seven with capacities up to 230,000 Btu per hour. Features include compactness, simplicity, automatic gas and fan shutoffs. Further information available. ----------Item 202

**AIR CONDITIONING COMPRESSORS.** Page 139. The Glenn L. Martin Company, builders of Matador bombers and other planes, uses 27 of these compressors for air conditioning and special cooling services. Details available. ----------Item 203

**INSULATED PIPE.** Page 139. A 12-inch overhead pipe line in Michigan's upper peninsular is protected against minus 40F weather by prefabricated insulated piping. ----------Item 204

**GREASE FILTERS.** Page 16. How grease eliminators make kitchens safer by trapping grease before it forms a fire hazard in ventilating ducts. Periodic duct cleaning is eliminated because the filters are easy to clean. Further information available. ----------Item 205

**HEATING PUMPS.** Page 131. A heating pump for every heating installation, available in capacities from 500 to 65,000 sq ft of radiation, and with a long record of dependable performance. ----------Item 206

**AIR CONDITIONING.** Page 50. Rustproof finish adds years of life to air conditioning and refrigeration equipment which must withstand brine spray, water, and fumes. Air conditioning equipment is finished in a bonderized two-coat backed chlorinated rubber enamel finish. Process illustrated and described. Information available. ----------Item 207

**AIR CONDITIONING COMPRESSOR.** Page 69. An accessible hermetic air conditioning compressor which eliminates belts, seals and manual oiling, which are responsible for nine out of ten service calls. Feature is accessibility. Available from ¼ to 3 hp in air cooled and 1/3 to 7½ hp water cooled units. Catalog available. ----------Item 208

**MOTOR CONTROLS.** Page 72. These motor controls are popular for refrigeration and air conditioning service because they are trouble-free, have only one moving part, silver alloy contacts never need cleaning, filing or dressing. Bulletins available. ----------Item 209

**SPACE HEATERS.** Page 53. How twelve large direct fired heaters were bought by Ford Motor Co. for temporary heating on a construction project, following which four were shipped to Canada for permanent installation, eight to Kansas City for temporary use, and thence permanently installed in an assembly plant in Buffalo. The rugged construction paid off. Six bulletins available. ----------Item 210

**AIR FILTERS.** Page 70. How electronic air filters were specified at the Inter-Library Center in Chicago to protect 36,000 feet of books against dust, discoloration and smoke damage. Experience reports on filters of all types available.--------Item 211

**BOILERS.** Page 39. How hospitals have found this integral furnace boiler uniquely suitable to meet their varied steam requirements. Cost saving features are listed. Available in standard sizes for loads to 28,000 lb of steam per hour. Bulletin available. ----------Item 212

**AIR DIFFUSERS.** Page 73. High velocity packaged aspirating units consisting of a combination static pressure and velocity reducing valve and sound attenuating chamber is one of several types of draftless air diffusers. Manual available. ----------Item 213

**PIPE HANGERS.** Page 61. Most practical and inexpensive way of hanging pipe for many jobs. Available for pipe from ½ to 8 inches. Other types of hangers illustrated and described. ----------Item 214

**OIL PREHEATERS.** Page 29. Two separate units, one for warming fuel oil in the storage tank so that it will move easily through the pipes, the other a separate preheater for thorough atomization. Only oil to be pumped is heated. Information available. ----------Item 215

**STRAINERS.** Page 137. Strainers which screen out foreign matter from oil, water and other liquid lines. Has cover held in place by toggle bolts to simplify cleaning. ----------Item 216

**GAS BURNER.** Page 138. A gas conversion burner for hard-to-fire applications has forced draft design to reduce problems of natural draft. Uses minimum of space. Completely packaged. Literature available. ----------Item 217

**STEAM GENERATORS.** Page 17. A line of steam generators, performance rated, fully automatic. Burn oil, gas, or both. In 18 sizes. Have 5 sq ft of heating surface per boiler hp. Catalog available. -----Item 218

**MOTORS.** Page 48. Capacitor-start motors for use where starting loads are fairly heavy but which can be brought to operating speed quickly. Applications include air conditioners, water pumps, motor-driven tools, and similar fractional or integral horsepower applications. Bulletin available. ----------Item 219

**Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.**

**PLEASE SEND US MORE INFORMATION.**

**Circle below item numbers on which you wish further information.**

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**PLEASE PRINT** Aug. H-53

**Name** ..... **Title** .....

**Firm** .....

**Nature of Firm's Business** .....

**Street** .....

**City** ..... **Zone**.....**State** .....

This card is void after Nov. 1, 1953

# HEATING and VENTILATING'S

# *Ad-Digest* SERVICE

**MOTORS.** Page 43. Dependability is the feature of a line of motors that include totally-enclosed fan-cooled, open ball bearing, totally-enclosed, and explosion-proof types. Details available. ---**Item 220**

**PUMPS.** Page 7. Easy to install pumps which meet 90% of air conditioning needs. In three types for different applications, one with capacities to to 80 gpm, a second up to 500 gpm and a third up to 2500 gpm. Free engineering help and bulletins available. ----------**Item 221**

**DIAL THERMOMETERS.** Page 148. Mercury actuated dial thermometers in three types—rigid stem, wall mounted, or flush mounted—feature accuracy, adjustability for angularity, readability, and interchangeability. Bulletin available. -**Item 222**

**FANS.** Page 139. Fan blades are individually precision set to proper pitch and blade is locked to hub in this line of fans incorporated in roof ventilators, chimney style attic fans, duct fans, and other types. Catalog available. ----------**Item 223**

**UNIT HEATERS.** Page 154. Available in horizontal and vertical types. Former has all-copper coils, standard motors, in sizes up to 272,000 Btu per hour. Vertical type has spiral fin tube construction in sizes up to 575,000 Btu capacity. --------**Item 224**

**VANE AXIAL FLOW FANS.** Page 57. These fans are quiet, compact, unmatched in ventilating efficiency, and recommended for public buildings. Typical library installation illustrated. Bulletin available. ----------**Item 225**

**OIL BURNERS.** Page 125. A line of industrial, commercial and residential oil burners for every firing need, chosen by heating contractors because of their dependability, easy installation, performance and automatic operation with fluctuating loads. Information available. ----------**Item 226**

**FUELS.** Page 34. How a New Jersey orchid grower who needed dependable heat selected a coal fired plant and saved $14,000 the first year. Advantages of bituminous coal listed, including stability of price. ----------**Item 227**

**BRAZING.** Page 149. A booklet on how to braze with low temperature silver brazing alloys in one easy lesson. ----**Item 228**

**STEEL BOILERS.** Page 63. Jet action circulation sweeps steam bubbles on tubes into motion, creating maximum heat transfer. Boilers available in high firebox, Scotch marine, split firebox, front smoke outlet, and residential types, as well as in special designs. Catalog available. ----------**Item 229**

**TEMPERATURE CONTROL.** Page 122-123. How a customized temperature control system was chosen for the Shreveport Airport where six thermostats were employed to give comfort in as many different areas with different heat loads. Further information available. ----------**Item 230**

**HUMIDITY CONTROL.** Page 141. A new method of drying air precisely as wanted by contact with a liquid in a small spray chamber. Contact temperature and absorbent concentration, easily and positively controlled, determine exactly amount of moisture in leaving air. Information available. ----------**Item 231**

**SPRAY NOZZLES.** Page 132. A line of spray nozzles in two different types, involute for producing a fine hollow cone spray with minimum energy loss, and fan spray for flat fan shaped spray with time saving slicing action for cleaning. Bulletin available. ----------**Item 232**

**DRAFT CONTROLS.** Page 142. Draft controls for commercial gas-fired heating plants to give accurate fuel saving performance. Information available. -**Item 233**

**RESIDENTIAL COOLING TOWERS.** Page 38. A line of residential cooling towers from 2 to 15 ton capacities offers as an exclusive feature a 20-year guarantee on its wetted deck surface. Priced for the home market which has increased because cooling towers are now required in many areas. ----------**Item 234**

**FUEL BURNERS.** Page 37. A line of burners for gas, oil or dual fuel in 30 to 1,000 hp capacities. The gas and oil burners can be field converted to dual fuel. The dual fuel burners will burn either fuel at the flick of a switch. Factory packaged electronic combustion safeguards. ---**Item 235**

**STEAM TRAPS.** Page 141. How heat-up time in a processing plant was reduced 48% by use of thermostatic steam traps which have two to six times average drainage capacity, low temperature differential, and maximum air venting. Bulletin available. ----------**Item 236**

**FAN VENTILATOR.** Page 150. A low type fan ventilator whose low height and functional outline meet architectural and building requirements for appearance, is easily installed and serviced and operates as either a supply unit or as exhaust fan. ----------**Item 237**

**AIR-COOLED CONDITIONER.** Page 32. The answer to air conditioning jobs where water is hard to get, piping costs high, water pressure low, or where water is hard or corrosive, is the air-cooled packaged air conditioner. Uses no water. Available in 2 and 3 hp sizes. --------**Item 238**

**SPRAY NOZZLES.** Page 131. A complete selection of spray nozzles for humidifying, atomizing, cooling, or other applications, has fine break-up with minimum pressure. Each nozzle specifically designed for service intended. ----------**Item 239**

**STUD DRIVER.** Page 145. How studs can be driven straight into steel or concrete with a powder-actuated stud driver which sets up to five studs per minute and weighs only 5½ lb. Bulletin on reducing fastening costs available. --------**Item 240**

**FABRICATED FITTINGS.** Page 133. Standard and special fittings for lightweight pipe, saving time, material, and labor. Bulletin offering practical ideas to simplify piping layouts available. --------**Item 241**

**HEATING AND VENTILATING UNITS.** Page 60. Heating and ventilating units for heating, filtering and recirculating air, or for ventilation, in wall, floor, or ceiling mountings. Wide range of optional equipment available. ----------**Item 242**

**ROOF VENTILATORS.** Page 149. Rotary ventilators feature life-time guaranteed bearings and enduring metallic finish on galvanized steel. In sizes from 6 through 48 inches. Have certified capacity ratings. ----------**Item 243**

**WASHABLE AIR FILTERS.** Page 49. A washable air filter selling retail from $1.55 up for forced air furnaces and air conditioners are profitable to dealers. -**Item 244**

**GAS UNIT HEATER.** Page 147. A line of gas-fired unit heaters in seven sizes with heat outputs from 20,000 to 160,000 Btu per hour. ----------**Item 245**

**INSTRUMENT DATA.** Page 156. A new instrument data book containing 60 pages about the company's precision instruments for checking combustion, draft, pressure, flow, velocity, $CO_2$, smoke, temperature, and other conditions. ----------**Item 246**

**STEAM TRAPS.** Inside front cover. An explanation why vacuum isn't vacuum to a steam trap, but simply pressure below atmospheric. Mechanisms in these traps for low pressure vacuum return service are identical to those in traps for high pressure. A feature is low operating costs. Bulletin available. ----------**Item 247**

**RADIATOR TRAPS.** Page 40. Success of a steam distribution system can hinge on the radiator trap. These traps feature a rugged but sensitive thermostatic diaphragm, seamless, filled with accurate charge of volatile fluid and finally tested. Catalog available. ----------**Item 248**

**CEILING PANELS.** Page 18. Modular concealed ceiling panels cost less to install than air diffusers and are simply and easily positioned. Even air motion is assured as well as exceptional uniformity and control of room temperatures. Panels are adaptable, flexible, adjustable, and completely concealed. Literature available. ----------**Item 249**

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING
148 LAFAYETTE STREET
NEW YORK 13, N. Y.

AD-DIGEST SERVICE

Use this Digest to locate and refer to advertisements appearing in this issue of HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

**BASEBOARD CONVECTORS.** Page 14-15. Step-by-step picture story showing how hours are saved on the job by installing these modern baseboard convectors. Twelve construction features listed. Information on capacities, dimensions, and control available. ----------**Item 250**

**TURBINE VENTILATORS.** Page 156. Accurately rated, wind-driven turbine ventilators built of heavy gage coated iron, almost noiseless, in diameters from 6 to 48 inches. Motor driven ventilators also available. Catalog. ----------**Item 251**

**COMBINATION BURNER UNIT.** Page 68. A packaged oil, gas or gas-oil burner unit which includes burner, controls, fuel system and forced draft air supply in a balanced package unit, ready for bolting to boiler front. ----------**Item 252**

**WATER CONTROLLER.** Page 140. A thermostatic control for group showers, hospitals, industrial purposes, and other applications, has five features. ----**Item 253**

**DUCT INSULATION.** Page 30. A soft resilient and easily cut glass fiber insulating wall for wrapping ducts has a *k* factor of .25 at 50F. Brochure and application manual available. ----------**Item 254**

**STEEL PIPE.** Page 24. A steel pipe which produces a minimum of burrs in cutting because it is made of quality steel. Among the features of this pipe are its ductility, weldability, strength and toughness, roundness and straightness. -----**Item 255**

**AIR DIFFUSER.** Page 59. All diffuser types in a new line are identical in appearance with beautifully styled matching facial contours and the same number of rings, assuring uniformity. Catalog available. ----------**Item 256**

**AIR CONDITIONING.** Page 64. This company makes wide range of air conditioning equipment, does not have to compromise in recommending any one of a few systems for a given job but can recommend with broad impartiality installation that precisely suits the buliding being air conditioned. ----------**Item 257**

**ROOF EXHAUSTERS.** Page 146. Power roof exhauster each size actually physically rated to give a true picture of the unit as it operates. Units have built-in-scroll effect which can develop high static pressure. Infromation available. -**Item 258**

**VENT VALVES.** Page 19. Vent valve for one- or two-pipe steam, hot water, residential or industrial heating. Complete line illustrated and hook-ups shown. ----------**Item 259**

**HIGH VELOCITY SYSTEM.** Page 12-13. How the architects and engineers of an insurance company building addition save space by use of high velocity system with small ducts with air valves back of each outlet with very low noise level. Can be applied to new or old buildings. Booklet available. ----------**Item 260**

**TEMPERATURE CONTROL.** Back cover. An automatic temperature control system adapted to a building heated by radiant floor and wall panels. System is weather compensated and rooms are individually controlled. Same system used in central ventilating and air conditioning systems in same building. ----------**Item 261**

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

**INSULATED PIPE.** Page 42. 120 feet of six inch steam line installed in eight hours under eight railroad tracks without delaying trains. Installation possible by use of pre-fabricated insulated piping. System in use ten years. Cost is extremely low. Catalog available. ----------**Item 262**

**STEEL PIPE.** Page 52. With the largest selling steel pipe in the world you can be sure you will get pipe whose metallic sructure, strength, sound joints, superior cutting, bending and threading properties assure easy installation and long, trouble-free performance. ----------**Item 263**

**PIPE INSULATION.** Page 22. A pipe insulation easy to use and which won't chip, break, powder, or fray. Quick and clean to apply. ----------**Item 264**

**HOT WATER BOOSTER.** Page 51. Made smaller and more compact to meet demand for space saving equipment, this booster is precision built with leak-proof features, balanced impeller and available in ¾, 1, and 1¼ inch sizes. Has same capacity as previous models with larger motors. Catalog available. ----------**Item 265**

**PACKAGED AIR CONDITIONER.** Page 41. Perfected by fifteen years of experience, this line of packaged air conditioners features long life, slow speed operation, quietness, five year warranty, and available in six sizes for 2 to 15 tons. Franchise is available. ----------**Item 266**

**PREHEATERS.** Page 141. A preheater for heavy fuel oils or other liquids to obtain proper flow temperature before entering suction line. Steam or hot water can be used as heat source. ----------**Item 267**

**BLOWERS.** Page 147. Furnace and air conditioning blowers with wheel sizes from 7½ to 27 inches. Catalogs available. ----------**Item 268**

**RADIATOR TRAPS.** Page 137. Twenty years without replacement is the claim made for radiator traps of faultless design, superior materials and expert workmanship. Catalog available. -----**Item 269**

**AIR DIFFUSERS.** Page 35. A special high pressure air diffuser was developed for a suburban branch of a Baltimore department store. It permits air supply in any given area to be changed without unbalancing the air delivery of other outlets. Bulletin available. ----------**Item 270**

**PACKAGED BOILERS.** Page 33. A self-contained boiler by a manufacturer with twenty years experience and 12,000 installations. Advantages of packaged boilers summarized. Catalog available. -**Item 271**

**BASEBOARD HEATING.** Page 2. A Wisconsin home built three years ago planned for solar heating with large amounts of glass in walls. Baseboard heating is giving floor to ceiling temperature differential of 3 degrees, warms large picture window areas, is clean and inconspicuous. For new houses or for modernization. ----**Item 272**

**SNOW MELTING.** Page 135. The John Hancock building sidewalks in Boston rank as one of the largest snow melting jobs. Converters heat 225 gpm of 50% ethylene glycol to 180F. Information on snow melting equipment offered. -**Item 273**

**COPPER TUBE.** Page 119. Why this copper water tube is preferred by architects, builders and contractors. Reasons include that it is easy to bend, comes in handy lengths, uses solder or compression fittings, and is non-rusting. -------**Item 274**

**TANK DRAINING.** Page 56. A line of pressure tanks for hot water heating systems with a new feature which reduces draining time since there is no need to drain the whole system. Device incorporates vacuum breaker. Thirty gallon tank will drain in ten minutes. ----------**Item 275**

**CONVECTORS.** Page 25. Detailed features of a line of convectors including air seal, damper control, over-size grille, modern cabinet, simplified piping, cleanability, simplified element supports, and others. Catalog available. ----------**Item 276**

**FANS.** Page 20-21. Excessive maintenance costs can come from improper selection of equipment. This company manufactures twenty lines of fans and blowers and is equipped to recommend the proper fan so that maintenance costs are at a minimum. ----------**Item 277**

**METAL FRAMING.** Page 151. A framing system made of five basic sizes of channel gives great strength for supporting long runs of heavy piping, including 16-inch chilled water lines. Details of system illustrated. Catalog available. ----**Item 278**

**PACKAGED BOILERS.** Page 155. Real savings in installation and operation accrue from use of packaged boilers made in twenty sizes. Fully automatic and trouble-free. Bulletin available. ----------**Item 279**

**PLEASE SEND US MORE INFORMATION.**

**Circle below item numbers on which you wish further information.**

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**PLEASE PRINT** Aug. H-53

**Name** ..... **Title** .....

**Firm** .....

**Nature of Firm's Business** .....

**Street** .....

**City** ..... **Zone**.....**State** .....

This card is void after Nov. 1, 1953

# HEATING and VENTILATING'S

# *Ad-Digest* SERVICE

**ODOR ADSORBER.** Page 28. An accordion-like odor filter giving maximum adsorbing surface has been tested with over 15,000 materials for odor and gas adsorption. There are sizes for any enclosed area. ----------Item 280

**BOILER TUBES.** Page 39. No boiler is better than its tubes. Boilers of all types equipped with these tubes have been meeting utility, industrial and every other kind of rugged service requirements over the years. ----------Item 281

**GAS BOILER.** Page 23. A new line of hot water or steam gas boilers has numerous features, including large water capacity, large domestic hot water supply, cast iron sections, adaptability for piping, and removable burner assembly. Bulletin available. ----------Item 282

**ELECTRONIC CLEANER WASHER.** Page 129. A new low cost washer for electronic air cleaner is automatic, cuts maintenance costs, and eliminates inside the duct washing of cells. Features moving nozzles. Re-applies adhesive by push-button operation. ----------Item 283

**TEMPERATURE REGULATOR.** Page 44. Packless construction, a large balanced metal diaphragm, and a specially sensitive pilot are the three reasons why this temperature regulator functions dependably and accurately year after year. Catalog available. ----------Item 284

**AIR CONDITIONING UNITS.** Page 62. New features of this line of air conditioning units include a muggy air control, blow-through design, anti-sweat construction, quiet operation, and attractive appearance. Bulletin available. ..Item 285

**HOT WATER HEATING.** Page 26. This company will begin a big push on consumer advertising in the September 21 issue of LIFE and urges contractors to make use of sales aids available in tieing-in with this sales promotion on comfort heating with hot water. ----------Item 286

**TEMPERATURE CONTROL.** Page 65. A pneumatic temperature control system was selected for the heating and ventilating system and 88 showers in a western college. Comfortable room temperature and fuel economy is assured by use of this system. ----------Item 287

**HEAT TRANSFER COILS.** Page 134. Heating, cooling, air conditioning and process heat transfer surface is made by this company whose engineers are available to find the right answer to your heat exchange problem. ----------Item 288

**REFRIGERATION EQUIPMENT.** Page 66. A complete line, including water chillers, condensers, unit coolers, cooling towers, oil separators, heat exchangers, liquid receivers, water coolers, liquid chillers, and remote control conditioners. ....Item 289

**DUCT INSULATION.** Page 54. Glass fiber duct insulation for heating and cooling ducts, cuts loss, increases efficiency. Also usable as a duct liner for reducing sound. Bulletin available. ----------Item 290

**FLUSH VALVES.** Page 11. These valves, used for a huge nurses' school and residence in a New York hospital, have a protected monel metal bypass precluding corrosion in a trouble-susceptible area. Fine mesh screen prevents clogging by sand and debris. ----------Item 291

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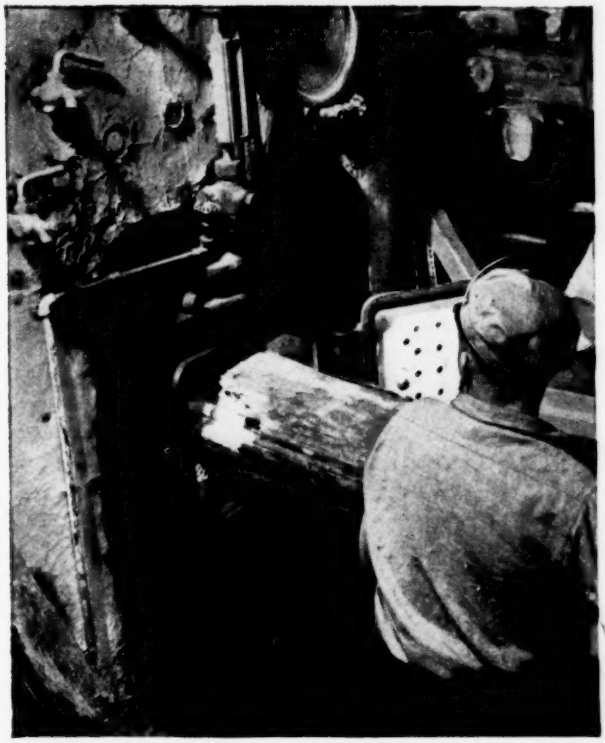

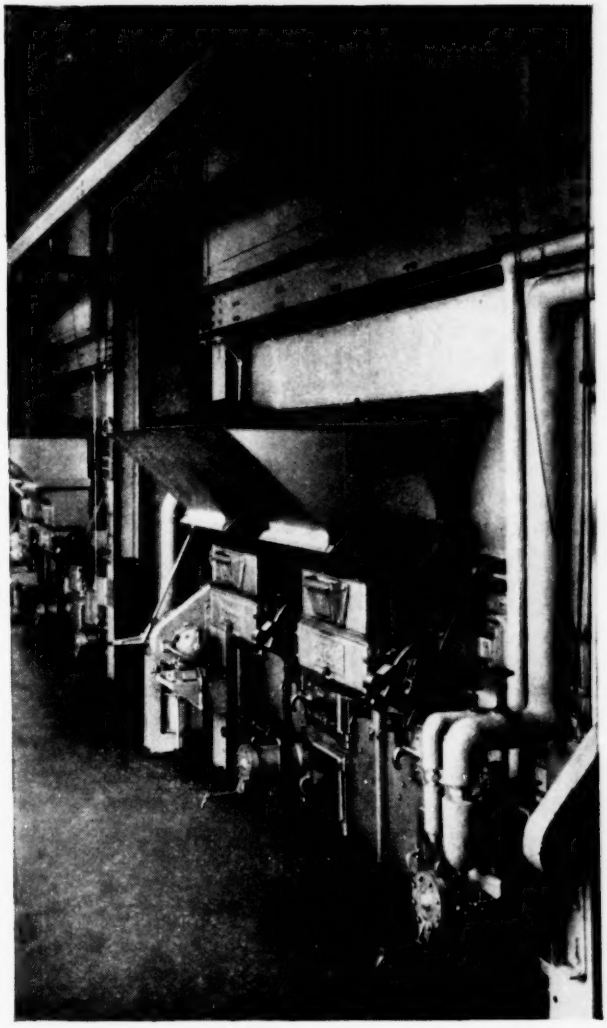

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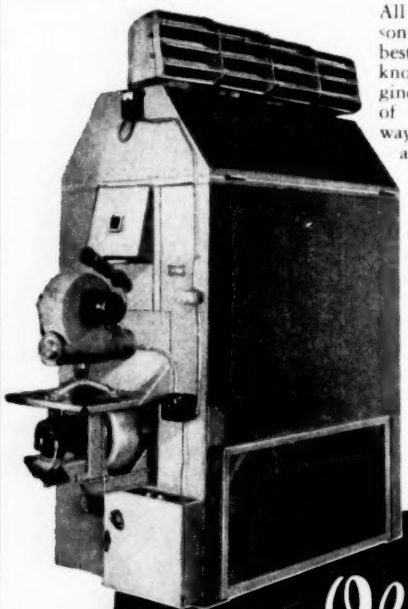

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## F. E. GIESECKE

(*Continued from page* 142)

In 1906-07 he studied European heating and ventilating methods in Germany. Dr. Giesecke became professor of Architecture at the University of Texas, Austin, in 1913. He was Director of the Engineering Experiment Station at A.&M. College of Texas from 1927 to 1939. At the time of his death, Dr. Giesecke was Professor Emeritus at the College and a consulting engineer. The author of several technical books, including *Hot Water Heating and Radiant Heating and Radiant Cooling*. Dr. Giesecke was joint author with A. Mitchell and H. G. Spencer of *Technical Drawing and Technical Drawing Problems*.

# WHAT READERS SAY

## UNITS VS. CENTRAL SYSTEM

EDITOR, HEATING & VENTILATING:

I read your article concerning window units being selected for an office building in Pittsburgh (Window Units Selected for Office Building, H&V, July, 1953), and a statement that the approximate cost of water will be $420 per day. I presume this is based upon wasting 1,500 gallons of water per minute, which will be needed for the 500-ton installation. Actually the water consumption would be only 2% of this which is the average loss in a cooling tower.

It has been our experience as a mechanical contractor that ingenuity has never yet failed to accomplish the installation of a central plant where the problem has really been studied for any particular building. This company has encountered many cases; in a recent one condenser and chilled water lines were run on the outside of the building and a vertical decorative enclosure of stainless steel was erected to cover them. It not only gave added protection to the lines from weather, but it actually added to the building appearance by giving it a modern effect. It was not necessary to close off any elevator shafts such as is insinuated in this particular article. I have no doubt that there may be particular cases where window units are a practical solution and, being contractors, we have no partiality to any particular system as we install practically every type.

However, I think the statements in this particular article should not be left unchallenged although I can appreciate that the firm selling these window units will boost this installation.

It is interesting to note, however, that most of the large office buildings that we have completed all have individual room control for the tenants. This is not considered unusual today, but is actually required.

Our main objection to window units other than the console type is that unless they replace a radiator and a

(*Continued on page* 146)

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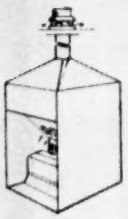
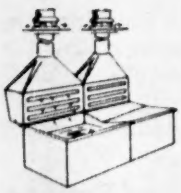
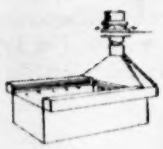


Gallaher ratings are the result of actual physical tests of the entire unit—*not* a fan wheel alone or other component, *not* interpolations of free air data, but a true picture of the unit as it operates under actual conditions.

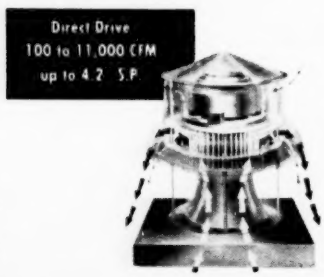


*Any other method of rating a power roof exhauster will be inaccurrate.* Gallaher research has shown conclusively that the errors may run as high as 50% when ratings are mere theoretical calculations.



Gallaher units with patented, built-in *scroll effect* are the only power roof exhausters which can develop high static pressures. With this feature, thousands of industrial applications are well within the range of economical power roof exhausters. They have been rated in an independent laboratory under the direction of a nationally recognized authority under the conditions prescribed by NAFM and ASH&VE.

Before you buy power roof exhausters we think you'll agree that these three questions should be answered to your satisfaction. 1. How were the tests conducted? 2. Did it include the whole unit and not a component? 3. What impartial authority conducted the tests? We think that you'll buy Gallaher Air-Vans.

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# WHAT READERS SAY

*(Continued from page 144)*

heating coil is installed, they protrude beyond the building line, are often installed by appliance dealers in a haphazard manner, and the question of legality is raised as to whether or not anything extending beyond the building line is dangerous. We do not believe this question will be resolved until one of them actually falls. The units also streak up the facade and stone finish.

I note on this installation the units will be pulled into the room. As everyone is now familiar with the depth of such units, it occurs to the writer that many tenants will object to this large extension into their space. Of course there are many other pros and cons such as the question of electric wiring, current consumption, maintenance and noise.

*Robert K. Raisler*
*Vice-President,*
*Raisler Corp.*

*New York, N. Y.*

# COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

**PROFESSIONAL ENGINEERS MEETING**—The seventh annual summer meeting of the Wisconsin Society of Professional Engineers, at Elkhart Lake, Wis. R. J. Mendenhall, W.S.P.E. program committee, A. O. Smith Corp., Milwaukee 1, Wis. . . . . **SEPTEMBER 18-19, 1953**

**INSTRUMENT EXHIBIT**—8th National Instrument Conference and Exhibit of the Instrument Society of America, at the Sherman Hotel, Chicago, Ill. John McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa. . . . . **SEPTEMBER 21-25, 1953.**

**CORROSION ENGINEERS MEETING**—Meeting of the South Central Region, National Association of Corrosion Engineers, at the Mayo Hotel, Tulsa, Okla. Executive secretary of the Association, 1061 M & M Bldg., Houston 2, Tex. . . . . **OCTOBER 7-9, 1953.**

**INDUSTRIAL HYDRAULICS CONFERENCE**—Ninth annual National Conference on Industrial Hydraulics, sponsored by the Illinois Institute of Technology, at Sheraton Hotel, Chicago, Ill. Otmar E. Teichmann, conference director, Illinois Institute of Technology, Chicago 16, Ill. . . . . **OCTOBER 8-9, 1953.**

**AGA CONFERENCE**—Annual conference of the American Gas Association, at Kiel Auditorium, St. Louis, Mo. Secretary of the Association, 420 Lexington Ave., New York, N. Y. . . . . **OCTOBER 26-28, 1953.**

**CONTRACTORS CONVENTION**—Annual convention of the Refrigeration & Air Conditioning Contractors Association, at the Carter Hotel, Cleveland, Ohio. Secretary of the Association, 228 N. LaSalle St., Chicago 1, Ill. . . . **NOVEMBER 8-11, 1953.**

**ALL-INDUSTRY EXPOSITION**—8th All-Industry Refrigeration & Air Conditioning Exposition, at the Public Auditorium, Cleveland, Ohio. Geo. E. Mills, show director, 1346 Connecticut Ave., Washington 6, D. C. . . . . **NOVEMBER 9-12, 1953.**

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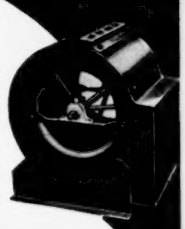

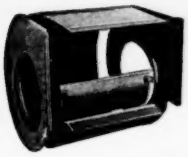

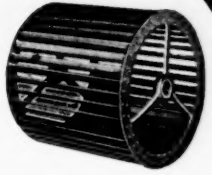

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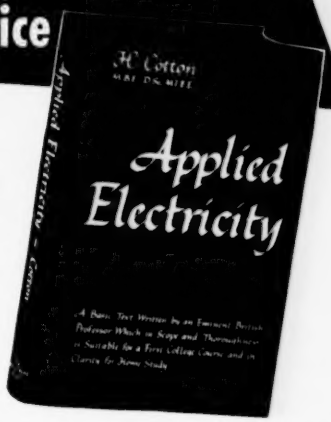


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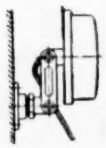

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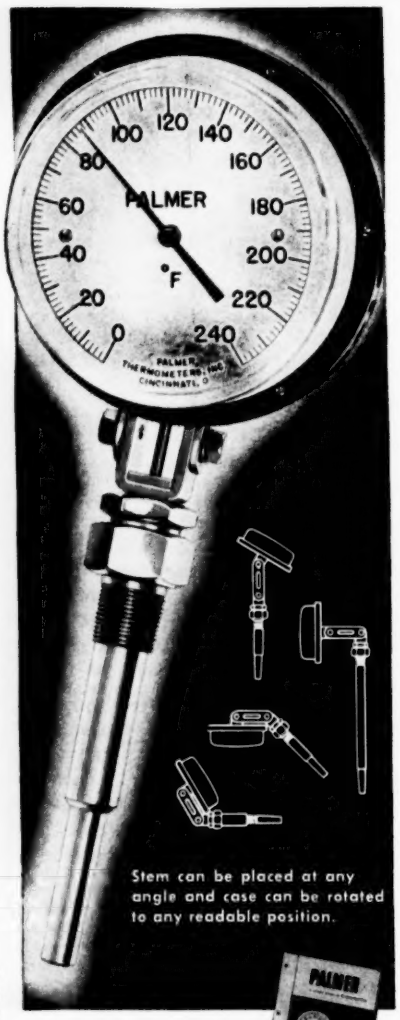

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## PLASTIC TUBING FOR RADIANT HEAT

(*Continued from page* 120)

the desired heating. Although this might be satisfactory, I doubt it because the radiation would not be sufficient to equalize the center of room temperature with that nearer the exterior walls."

I am inclined to be more optimistic as to its use in Southern Florida. The plastic pipe could be laid as a hose for an inexpensive installation in a house already built and it could, if desired, be readily disconnected at a few places for removal during about eight months of the year. Many go without any kind of heat, hence they could bear with something which falls short of perfection and which for the brief period of heating should for many be rather inexpensive. Furthermore, the center of the room in the South is rather close to the walls, living rooms in particular being relatively long to provide maximum sunlight and breeze through glass jalousied walls and doors. Again, since the jalousies are glass and with many lineal feet of crack for air infiltration, it is desirable to have heat near the walls to warm the glass and the entering air. This air will be forced across the room to exit through the jalousies on the opposite wall.

Since the air cannot leave the room without crossing the center of the room and its occupants, and since the radiant heat is all at the walls, the air should be warmed sufficiently. The purpose of the jalousies is to effect that very air movement in hotter weather.

Nor is there any great need to warm the floor or furniture since the long hours of sunlight take care of this. There are only a few hours of heating for early morning and late evening and there are only a few days this need occurs. This makes for fairly high soil and floor temperatures with low heat loss to the ground, even when tubing is in the floor. Because of such soil and temperature conditions, the water temperature and the temperature drop can be low. Hence, floor coils can be in series or continuous without an appreciable temperature drop. It would also seem that pipe centers need not be close.

According to the plastic pipe manufacturers, expansion of pipe due to direct sunlight makes it necessary to straighten out the pipe before all of the bends are secured at intervals of 30 to 36 inches. In application, the flexible ¾ inch plastic pipe is laid on 12-inch centers and about 8 inches from the outer walls. It is banded to the cement in but a few places. Cement is poured 2½ to 3 inches thick over the pipes which need not be filled with water to overcome the effect of this pour. The pipe is laid on the standard cement base, 2 inches thick, over which is laid aluminum foil to radiate the heat upward.

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A. M. Byers Co. has a motion picture of snow melting. New York City has under consideration a proposed law to require snow melting systems for sidewalks in front of all new buildings exceeding six stories in height. In Seattle the extreme cold sometimes freezes coin boxes of parking meters. The collector now goes around with a blow torch in such weather.

A weather sensing unit has been designed primarily

(*Continued on page* 150)

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**EASILY INSTALLED AND SERVICED**— Airshaft base is designed to fit over a standard square curb with ample overhang for flashing. All internal parts are easily accessible for maintenance.

**VERSATILE**—Operates with equal efficiency as an exhaust fan ventilator or as a fresh air supply unit—on direct or belt drive.

**WIDE RANGE OF SIZES**—Available with fans from 12" to 60" in diameter—from 1/20 H.P. to 7½ H.P.

**SEE SWEET'S OR WRITE FOR BULLETIN SPV-16**

**FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES**

**The Burt Manufacturing Company**

**49 E. South Street, Akron 11, Ohio**

*(Continued from page 148)*

for snow melting at antennas, but it is especially useful for automatic operation of sidewalk snow removal systems. It looks like a bowl with a lightning rod fence, the latter to keep birds from nesting in the bowl. This device detects precipitation when the ambient temperature drops below 37F, the normal borderline temperature for fall of snow. An integral heater melts snow and ice collecting in the bowl.

### • VALVES AND PIPING

Valve handwheels are being improved so that they are more than just a mere wheel to turn. To close one tight, the operator's hand should not slip through contact with moisture or grease on the wheel itself. Nor should the hand contact the end of a hot stem as one finds out by experience. To obtain these features, a valve handwheel has been produced with non-slip lugs and a depressed stem. An air vent valve for use with all types of systems is another idea. It is readily adjusted to suit the kind of system.

Experiments with underground warm air ducts or pipes have shown that the heat loss decreases as the diameter is increased. For example, for a given condition the temperature drop in a 4-inch pipe is greater than in a 6-inch pipe. Although the air velocity increases, the heat losing surface decreases.

### • FIRE PROTECTION

Sprinkler heads have long been designed to discharge much of the water to the ceiling. Sometimes this results in large water drops, even streams of water. To prevent this, there is a head designed with a circular deflector built in which produces both a fine mist and a more even spray.

Socony-Vacuum Oil Co. sets afire one of its 2,000,000 gallon fuel oil tanks at Paulsboro, N. J., to demonstrate that air agitation can extinguish an oil fire simply and cheaply in but one or two minutes. The oil cannot burn when the air supply above it is sufficiently reduced or the vapors above are reduced to prevent concentration, as with adequate agitation of the air. This method, however, will not put out gasoline fires and some crude oil blazes.

### • SCRAP IRON

One ton of pig iron requires more than four tons of raw materials, mainly coal, iron and limestone. With scrap iron substituted, four tons of raw materials are saved. Furthermore, the scrap being already refined, the time required to refine steel is lessened. Incidentally, it takes 3½ tons of air per ton of ingot steel produced.

NDHA points out that a private plant should be converted into scrap iron if (1) the plant is no longer used, (2) not economically used, (3) kept for pride, (4) equipment is obsolete, (5) space taken up has become more valuable for other purposes, (6) accounting justifying its use is wrong, and (7) surroundings would be cleaner without it.

# PIPING RUNS INSTALLED

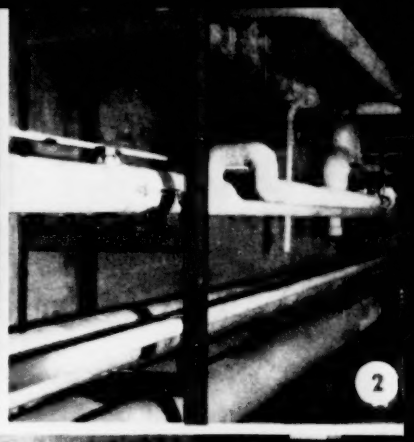
## *Better, Faster, for Less...*

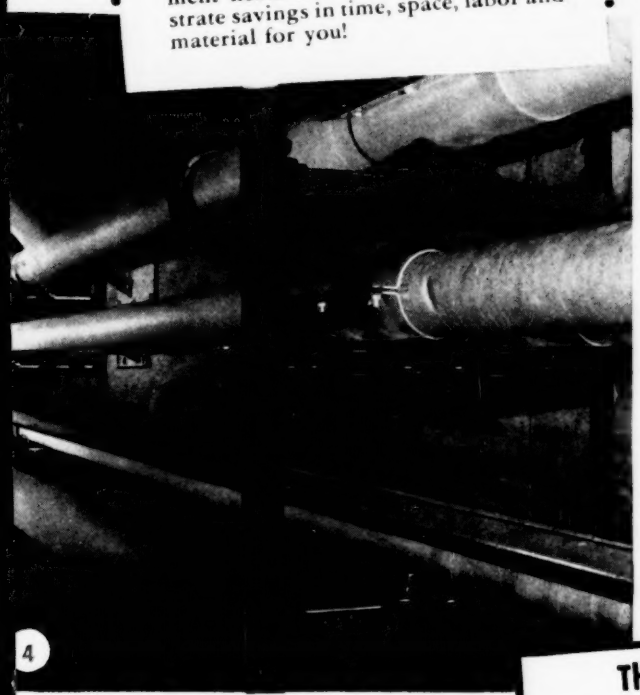
**with adjustable**

# UNISTRUT®

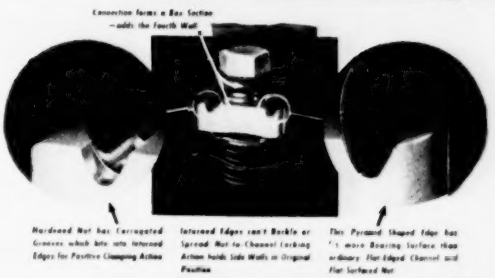
## METAL FRAMING

All-purpose construction material assures exact slope or pitch, permits changes or additions at any time. Easy to erect—no special tools or equipment needed. Let UNISTRUT demonstrate savings in time, space, labor and material for you!






**Only the UNISTRUT Framing System has this Positive Clamping Action at all Points of Connection!**


Connection forms a Box Section —adds the Fourth Wall
Hardened Nut has Corrugated Grooves which bite into Inturned Edges for Positive Clamping Action
Inturned Edges can't Buckle or Spread. Nut-to-Channel Locking Action holds Side Walls in Original Position
This Pyramid Shaped Edge has 7½ more Bearing Surface than ordinary Flat Edged Channel and Flat Surfaced Nut

1 Note how UNISTRUT framework's great strength easily supports long runs of heavy piping, including bulky 16" chilled water lines.

2 Typical piping installation supported by UNISTRUT framing, concrete inserts and roller pipe supports. Slotted channel permits attachment of fittings at any desired point.

3 Steamline showing method of supporting pipe at expansion joints. Note pipes are supported above and below with UNISTRUT pipe rollers.

4 Tunnel job showing how UNISTRUT continuous run concrete inserts can be installed vertically or horizontally, or at any angle required.

**UNISTRUT Products are Bonderized**

**Distributors and Warehouse Stocks in Principal Cities. Consult your Telephone Directories.**

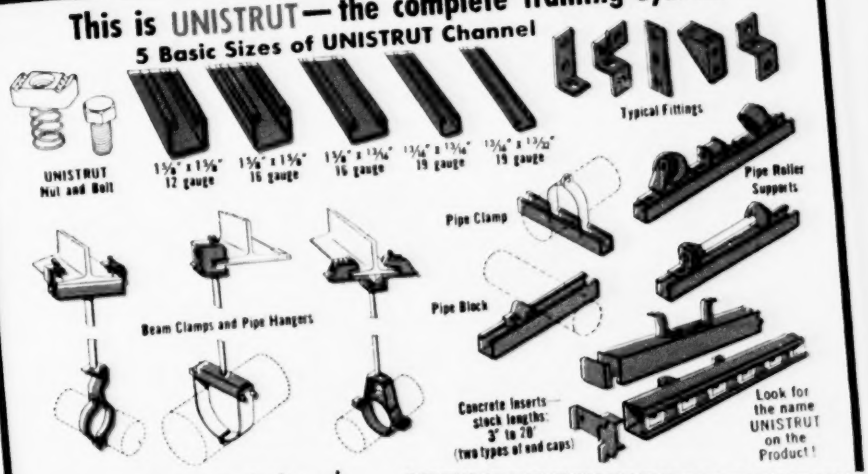
**See our Catalog in Sweet's 1953 Plant Engineering, Industrial Construction and Architectural Files.**

U. S. Patent Numbers

| | | |
|---|---|---|
| 2327587 | 2329815 | 2345650 |
| 2363382 | 2380379 | 2405631 |
| 2541908 | Other Patents Pending | |

## This is UNISTRUT—the complete framework system

**5 Basic Sizes of UNISTRUT Channel**


UNISTRUT Nut and Bolt
1⅝" x 1⅝" 12 gauge
1⅝" x 1⅝" 16 gauge
1⅝" x 13/16" 16 gauge
13/16" x 13/16" 19 gauge
13/16" x 13/32" 19 gauge
Typical Fittings
Pipe Roller Supports
Pipe Clamp
Pipe Block
Beam Clamps and Pipe Hangers
Concrete Inserts — stock lengths: 3" to 20' (two types of end caps)
Look for the name UNISTRUT on the Product!

*Typical stock channel, parts and fittings.*

**Write for NEW Free 84-page Pocket Catalog No. 800!**

For the Man on the Job—packed with photos, drawings, ideas and data on how to frame, mount, rack and support electrical and mechanical equipment with UNISTRUT metal framing.

***The World's Most Flexible All-Purpose Metal Framing***

**UNISTRUT PRODUCTS COMPANY**
**1013 W. Washington Blvd., Chicago 7, Ill.**
**Dept. V8**

Please send me a copy of the new Catalog 800, without obligation.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

# EFFICIENCY—DURABILITY STRESSED BY NATIONAL CHAMPION

## National Heater Executive Cites Internal Construction as Index to Heater Efficiency

Efficiency and rugged construction are elements demanded by engineers who are responsible to clients for selection of direct-fired space heaters, according to George C. Costello, secretary-treasurer of the National Heater Company, manufacturers of National Champion direct-fired heating equipment with headquarters in St. Paul, Minnesota.

"Internal construction is the major factor in determining heater efficiency," the executive said. "The National Champion heater has, in its design, straight in-line economizer tubes. These tubes allow hot exhaust gases to circulate through many feet of tubing before reaching the exhauster and stack." Economy reached by this system is 80% or more.

### Heater Advantages

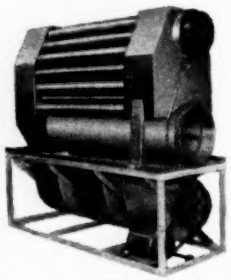
"Advantages of the National Champion heater are inherent in its construction," he continued. "Welded one-piece construction of the firebox and convectors allows for trouble-free long life. The stainless steel, teardrop firebox design is, in itself, an economical feature. Allowing for a clean wipe, the firebox design eliminates refactory maintenance or repair."

National Champion equipment, heavy and light oil series have been listed by Underwriters' Laboratories, Inc. and meets requirements for safety both from the standpoint of electrical safety control sequence and the firebox surface and casing temperatures to qualify on minimum clearance specifications.

### Large Area Heating

Designed for large area heating, National Champion units are produced in 12 models with capacities ranging from 200,000 to 2,000,000 BTU per hour.

All National Champion oil burners are pressure type and carry additional U.L. Listing for added protection. Electronic flame failure control is standard equipment. All units are wire and flame tested at the factory before shipment.



Internal Construction

Information and specifications are available upon request from the National Heater Company, 2184 Cleora Avenue, St. Paul 4, Minnesota.

**NATIONAL HEATER COMPANY, INC.**
**2184 Cleora Avenue, Dept. B St. Paul, 4, Minnesota**


# ABSTRACTS AND REVIEWS

*Publications abstracted in this department should be ordered direct from publisher.*

## TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING

Each year in the talks and discussions before the Plant Maintenance and Engineering Conference, there is presented a wealth of information about principles and techniques. To preserve these data and to make them available to those who could not attend the conference, it has become a practice to publish the papers and discussions in book form.

The 1953 sessions were sponsored by the American Society of Mechanical Engineers and the Society for the Advancement of Management and were held concurrently with the Fourth Plant Maintenance Show that was held at Cleveland, Ohio.

The 1953 volume has reports on 16 sectional conferences and 21 round table discussions, many devoted to special types of industrial plants or processes.

*Techniques of Plant Maintenance and Engineering, 1953. Cloth bound, 8½ x 11 inches, 288 pages. Published by Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y. Price, $6.*

• • •

MEASURING THE AVERAGE FLOW OF FLUIDS IN CLOSED DUCTS—A manometer developed by the University of Illinois mine ventilation laboratory was used to measure the flow of fluids in closed ducts, especially the flow of water, air, and other gases. Bulletin Series No. 410, on a multitube differential pressure manometer for measuring the average flow of fluids in closed ducts, gives the results of this study. It describes the theory and construction of the average velocity gage and analyzes possible sources of error in readings which are made with it. This 30-page bulletin covers methods of measuring, theory, error of various types of manometers and the various formulas. The Engineering Experiment Station, University of Illinois, Urbana, Ill.

NUCLEAR POWER REACTOR TECHNOLOGY—An 88-page bulletin has been issued by the Atomic Energy Commission on reports to the U. S. Atomic Energy Commission on nuclear power reactor technology. There are reports by the Commonwealth Edison Company, Public Service Company of Northern Illinois, Dow Chemical Company, Detroit Edison Company, Monsanto Chemical Company, Union Electric Company, Pacific Gas and Electric Company, and Bechtel Corp. It contains the declassified versions of reports made by four separate teams of nongovernmental industrial representatives who spent a year inside the atomic energy program appraising the prospect for private industrial participation in joint production of electric energy and fissionable material from reactors. U. S. Atomic Energy Commission, Washington 25, D. C.

# this man has ice water in his veins!

Of course he'd never volunteer to give blood, anyway. But any resemblance of this old duffer to the average, red-blooded American is a mistake.

For instance, several million healthy Americans have given blood. *But it's not enough.*

*So this is to tell several million more Americans that their blood is needed—now!*

We've never let anyone down who was in trouble. When a GI gets wounded and suffers *shock*—he's in bad trouble. He's got to have blood and lots of it! Folks here at home need blood too—to save their lives.

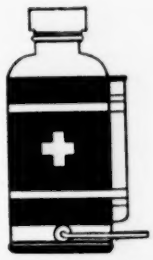
So make a date with your Red Cross, Armed Forces or Community Blood Donor Center. *One* hour and you're on your way.

## BUSINESS EXECUTIVES CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLANT BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOODMOBILE MAKE REGULAR VISITS?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . the need for blood is **urgent!**



# GIVE BLOOD

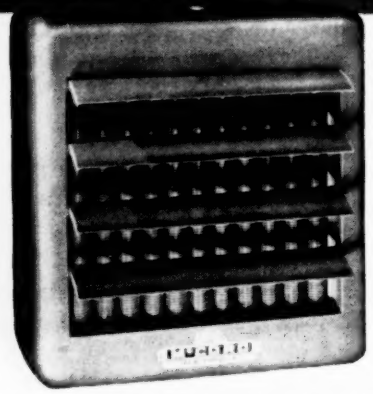
...give it again and again

NATIONAL BLOOD PROGRAM

# McCORD

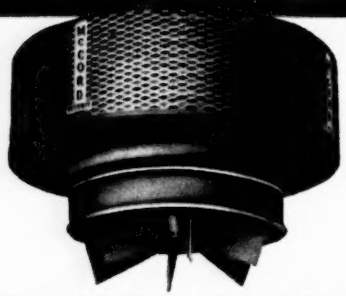
## HEATING AND AIR CONDITIONING PRODUCTS

### HORIZONTAL TYPE UNIT HEATERS



**Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.**

### VERTICAL TYPE UNIT HEATERS



**A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.**

**McCORD CORPORATION**
DETROIT 11, MICH.


## DEGREE-DAYS FOR JUNE, 1953

(A) Airport readings; (C) city office readings;
(O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 25th Year of Publication of Monthly Degree-Day Data

| City | June | | |
|---|---|---|---|
| | 1953 | 1952 | Normal |
| Abilene, Texas (A) | 0 | 0 | 0 |
| Albany, New York (A) | 47 | 21 | 0 |
| Albuquerque, New Mexico (A) | 0 | 6 | 0 |
| Alpena, Michigan (C) | 118 | 132 | 138 |
| Anaconda, Montana (C) | 328 | 246 | 251 |
| Asheville, North Carolina (C) | 0 | 0 | 0 |
| Atlanta, Georgia (C) | 0 | 0 | 0 |
| Atlantic City, New Jersey (C) | 24 | 4 | 0 |
| Augusta, Georgia (A) | 0 | 0 | 0 |
| Baker, Oregon (C) | (a) | 215 | 213 |
| Baltimore, Maryland (C) | 15 | 1 | 0 |
| Billings, Montana (A) | 125 | 49 | 60 |
| Binghamton, New York (C) | 53 | 38 | 0 |
| Birmingham, Alabama (A) | 0 | 0 | 0 |
| Bismarck, North Dakota (A) | 104 | 49 | 45 |
| Block Island, Rhode Island (A) | 72 | 26 | 99 |
| Boise, Idaho (A) | 170 | 87 | 0 |
| Boston, Massachusetts (A) | 32 | 4 | 0 |
| Bozeman, Montana (C) | 230 | 173 | 230 |
| Buffalo, New York (A) | 44 | 43 | 12 |
| Burlington, Iowa (A) | 1 | 3 | (a) |
| Burlington, Vermont (A) | 64 | (a) | 3 |
| Butte, Montana (C) | 252 | 190 | 236 |
| Cairo Illinois (C) | 0 | 0 | 0 |
| Charleston, South Carolina (C) | 0 | 0 | 0 |
| Charlotte, North Carolina (C) | 0 | 0 | 0 |
| Chattanooga, Tennessee (A) | 0 | 0 | 0 |
| Cheyenne, Wyoming (A) | 111 | 40 | 126 |
| Chicago, Illinois (C) | 29 | 17 | 59 |
| Cincinnati, Ohio (C) | 0 | 0 | 0 |
| Cleveland, Ohio (A) | 10 | 13 | 0 |
| Columbia, Missouri (A) | 0 | 0 | 0 |
| Columbia, South Carolina (C) | 0 | 0 | 0 |
| Columbus, Ohio (C) | 4 | 0 | 0 |
| Concord, New Hampshire (A) | 86 | 36 | 54 |
| Concordia, Kansas (C) | 6 | 0 | 0 |
| Dallas, Texas (A) | 0 | 0 | 0 |
| Davenport, Iowa (C) | (a) | 5 | 0 |
| Dayton, Ohio (A) | 3 | 2 | 0 |
| Deer Lodge, Montana (C) | 282 | 201 | 235 |
| Denver, Colorado (C) | 30 | 0 | 0 |
| Des Moines, Iowa (A) | 8 | 1 | 0 |
| Detroit, Michigan (A) | 15 | 14 | 0 |
| Devils Lake, North Dakota (C) | 133 | 76 | 96 |
| Dodge City, Kansas (A) | 5 | 0 | 0 |
| Dubuque, Iowa (C) | 21 | 19 | 0 |
| Duluth, Minnesota (C) | 214 | 181 | 216 |
| Eastport, Maine (A) | 238 | 206 | 300 |
| Elkins, West Virginia (A) | 30 | 24 | 0 |
| El Paso, Texas (A) | 0 | 0 | 0 |
| Ely, Nevada (A) | 225 | 224 | (a) |
| Erie, Pennsylvania (C) | 32 | 31 | 0 |
| Escanaba, Michigan (C) | 116 | 117 | 138 |
| Evansville, Indiana (A) | 0 | 0 | 0 |
| Fargo, North Dakota | 102 | 49 | 98 |
| Fort Smith, Arkansas (A) | 0 | 0 | 0 |
| Fort Wayne, Indiana (A) | 5 | 5 | 0 |
| Fort Worth, Texas (A) | 0 | 0 | 0 |
| Fresno, California (A) | 22 | 9 | 0 |
| Galveston, Texas (C) | 0 | 0 | 0 |
| Grand Junction, Colorado (A) | 7 | 4 | 0 |
| Grand Rapids, Michigan (A) | 16 | 21 | 0 |
| Green Bay, Wisconsin (C) | 50 | 64 | 0 |
| Greensboro, North Carolina (A) | 1 | 0 | 0 |
| Greenville, South Carolina (A) | 0 | 0 | 0 |
| Harrisburg, Pennsylvania (A) | 19 | 12 | 0 |
| Hartford, Connecticut (A) | 34 | 7 | 0 |
| Hatteras, North Carolina (C) | 0 | 0 | 0 |
| Havre, Montana (C) | 147 | 89 | 144 |
| Helena, Montana (A) | 222 | 160 | 171 |
| Houston, Texas (C) | 0 | 0 | 0 |
| Huron, South Dakota (A) | 41 | 12 | 0 |
| Indianapolis, Indiana (A) | 1 | 0 | 0 |
| Jackson, Mississippi (A) | 0 | 0 | 0 |
| Kansas City, Missouri (A) | 0 | 0 | 0 |
| Knoxville, Tennessee (A) | 0 | 0 | 0 |
| La Crosse, Wisconsin (A) | 26 | 26 | 0 |
| Lander, Wyoming (A) | 129 | 67 | 135 |
| Lansing, Michigan (A) | 19 | 36 | 0 |

(a) Data not available.

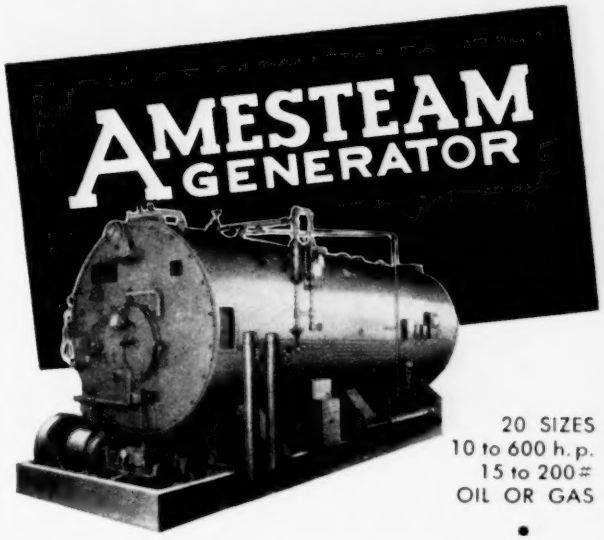
| City | June | | |
|---|---|---|---|
| | 1953 | 1952 | Normal |
| Lewiston, Maine (O) | 58 | 23 | 45 |
| Lincoln, Nebraska (C) | 10 | 0 | 0 |
| Little Rock, Arkansas (A) | 0 | 0 | 0 |
| Livingston, Montana (C) | 259 | 142 | 142 |
| Los Angeles, California (C) | 26 | 17 | 0 |
| Louisville, Kentucky (A) | 0 | 0 | 0 |
| Lynchburg, Virginia (A) | 3 | 0 | 0 |
| Macon, Georgia (A) | 0 | 0 | 0 |
| Madison, Wisconsin (C) | 18 | 26 | 0 |
| Marquette, Michigan (C) | 149 | 132 | 186 |
| Memphis, Tennessee (A) | 0 | 0 | 0 |
| Meridian, Mississippi (A) | 0 | 0 | 0 |
| Milwaukee, Wisconsin (A) | 57 | 55 | 39 |
| Minneapolis, Minnesota (A) | 37 | 21 | 0 |
| Moline, Illinois | 2 | 6 | (a) |
| Montgomery, Alabama (A) | 0 | 0 | 0 |
| Nantucket, Massachusetts (A) | 93 | 69 | 123 |
| Nashville, Tennessee (A) | 0 | 0 | 0 |
| New Haven, Connecticut (A) | 49 | 13 | 0 |
| New Orleans, Louisiana (C) | 0 | 0 | 0 |
| New York, New York (C) | 17 | 10 | 30 |
| Newark, New Jersey | 15 | 10 | 29 |
| Norfolk, Virginia (C) | 1 | 0 | 0 |
| North Head, Washington (C) | (a) | 335 | 309 |
| North Platte, Nebraska (A) | 25 | 0 | 0 |
| Oakland, California (C) | 130 | 143 | 93 |
| Oklahoma City, Oklahoma (C) | 0 | 0 | 0 |
| Omaha, Nebraska (A) | 10 | 0 | 0 |
| Oswego, New York (C) | (a) | 70 | 63 |
| Parkersburg, West Virginia (C) | 3 | 1 | 0 |
| Peoria, Illinois (A) | 0 | 4 | 0 |
| Philadelphia, Pennsylvania (C) | 16 | 7 | 17 |
| Phoenix, Arizona (C) | 0 | 0 | 0 |
| Pittsburgh, Pennsylvania (C) | 2 | 3 | 0 |
| Pocatello, Idaho (A) | 168 | 104 | 60 |
| Portland, Maine (A) | 129 | 47 | 81 |
| Portland, Oregon (C) | 166 | 122 | 90 |
| Providence, Rhode Island (A) | 36 | 7 | 0 |
| Pueblo, Colorado (A) | 5 | 0 | 0 |
| Raleigh, North Carolina (C) | 0 | 0 | 0 |
| Rapid City, South Dakota (A) | 68 | 27 | 30 |
| Reading, Pennsylvania (C) | 21 | 10 | 0 |
| Red Bluff, California (A) | 22 | 29 | (a) |
| Reno, Nevada (A) | 235 | 187 | 90 |
| Richmond, Virginia (C) | 4 | 0 | 0 |
| Rochester, New York (A) | 51 | 45 | 0 |
| Roswell, New Mexico (A) | 0 | 0 | 0 |
| Sacramento, California (C) | 33 | 33 | 0 |
| St. Joseph, Missouri (A) | 1 | 0 | 0 |
| St. Louis, Missouri (C) | 0 | 0 | 0 |
| Salt Lake City, Utah (A) | 64 | 41 | 0 |
| San Antonio, Texas (A) | 0 | 0 | 0 |
| San Diego, California (A) | 27 | 30 | 6 |
| Sandusky, Ohio (C) | 6 | 4 | 0 |
| San Francisco, California (C) | 212 | 245 | 195 |
| Sault Ste. Marie, Michigan (A) | 218 | 204 | 189 |
| Savannah, Georgia (A) | 0 | 0 | 0 |
| Scranton, Pennsylvania (C) | 41 | 26 | 0 |
| Seattle, Washington (C) | 187 | 177 | 162 |
| Sheridan, Wyoming (A) | 127 | 85 | 120 |
| Shreveport, Louisiana (A) | 0 | 0 | 0 |
| Sioux City, Iowa (A) | 14 | 1 | 0 |
| Spokane, Washington (A) | 231 | 139 | 81 |
| Springfield, Illinois (C) | 0 | 0 | 0 |
| Springfield, Missouri (A) | 0 | 0 | 0 |
| Syracuse, New York (A) | 55 | 42 | 12 |
| Tacoma, Washington (C) | (a) | 215 | 183 |
| Terre Haute, Indiana (A) | 2 | 0 | 0 |
| Toledo, Ohio (A) | 13 | 7 | 0 |
| Topeka, Kansas (C) | 0 | 0 | 0 |
| Trenton, New Jersey (C) | 25 | 12 | 0 |
| Utica, New York (O) | 74 | 73 | 0 |
| Valentine, Nebraska (C) | 41 | 9 | 0 |
| Walla Walla, Washington (C) | 85 | 63 | 0 |
| Washington, D. C. (C) | 13 | 0 | 0 |
| Wichita, Kansas (A) | 0 | 0 | 0 |
| Williston, North Dakota (C) | 134 | 66 | 54 |
| Winnemucca, Nevada (C) | 216 | 196 | 13 |
| Yakima, Washington (A) | 186 | 109 | 0 |

(a) Data not available.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.


# REAL SAVINGS

## in installation . . . in operation with these "PACKAGED" BOILERS




20 SIZES
10 to 600 h. p.
15 to 200# OIL OR GAS

•

**JUST SET IT ON YOUR CONCRETE FLOOR** — no special foundation or heavy stack are needed. You make BIG savings on installation of AMESTEAM GENERATOR because it's a complete, self-contained unit, ready to start generating steam!

**FULLY AUTOMATIC . . . TROUBLE-FREE!** Set it and forget it. No more continual dirt, dust and ashes. Models for oil or for gas, or combination units for either fuel.

**EASY TO CLEAN! EASY TO GET AT!** Davit-hinged doors at rear give quick access to furnace and all tubes — and look at the space under the shell!

**COMPLETE SERVICE!** Our LOCAL service man starts your unit and gives you three months' FREE service.

*Write for FREE bulletin TODAY!*

AMES IRON WORKS
Box E-83, Oswego, N. Y.
Gentlemen:
Please send me further information on AMESTEAM GENERATORS and name of nearest representative.

NAME .....
COMPANY .....
ADDRESS .....

**AMES IRON WORKS INC.**

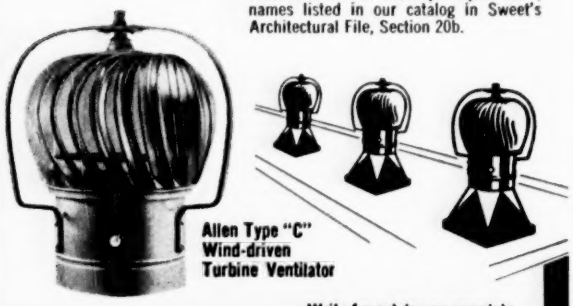
**BOX E-83** **OSWEGO, N. Y.**

## FOR TOP PERFORMANCE . . .

SPECIFY *Allen*

### TURBINE VENTILATORS

Accurately rated, wind-driven Allen Turbine Ventilators are doing a noteworthy air-displacing job on commercial and industrial rooftops all over the country. Ruggedly built of prime sheets of heavy-gauge coated iron, (special, non-ferrous metals also available), these almost noiseless ventilators are in stock, ready for immediate delivery to you. Throat diameters, 6 to 48 inches. Economical to install and maintain, Allen Turbine Ventilators give maximum performance per dollar spent. Another type, motor-equipped Electro-Wind Turbine Ventilator, is available for use in areas where wind velocities are not always sufficient. Engineering assistance gladly furnished. Our representatives are in most principal cities; names listed in our catalog in Sweet's Architectural File, Section 20b.



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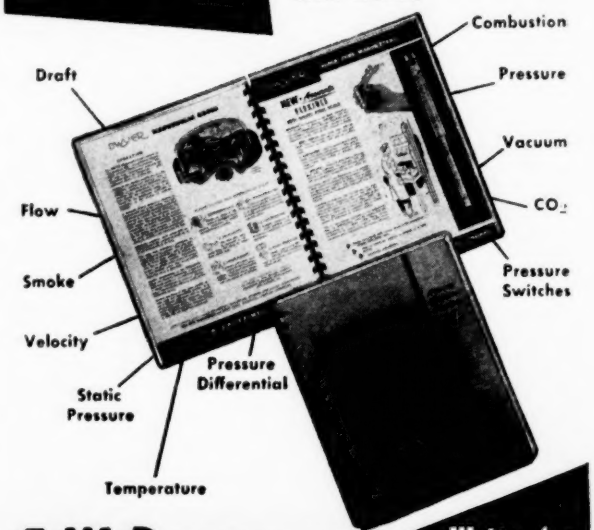


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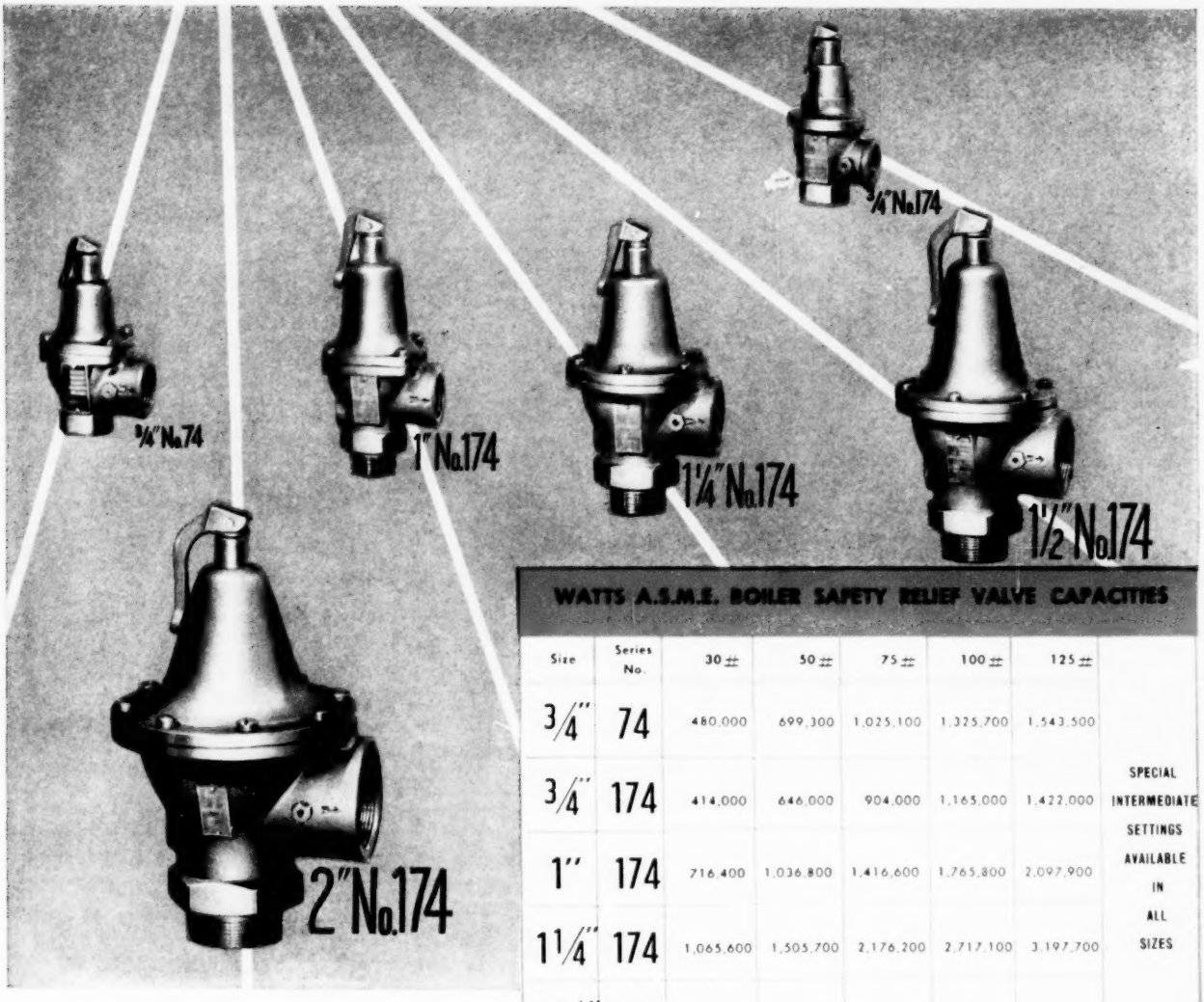


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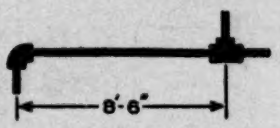
# ESTIMATING LENGTH OF PIPE WITH MALLEABLE FITTINGS

The accompanying data for determining the length of pipe between screwed fittings of malleable iron, prepared by Richard Irmiter, eliminate guesswork in determining allowances. The data apply to banded as well as plain fittings. Due to variations in manufacture, lubricant used, torque on the wrench and other factors, the figures are to be considered as close approximations.

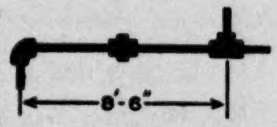
Each value in Table 1 represents the distance from the center-line of the fitting to the end of the pipe screwed into the fitting. To determine the pipe length, this distance must be subtracted from the measured distance between the two center-lines for *both ends* of the pipe.

*Example:* The center-line distance between a tee and a 90-degree elbow in a 2-inch line is 8 ft 6 inches. According to dimension *A* in Table 1 the distance to subtract for the elbow is 1½ inches. The same for the tee. The total distance to subtract is the sum of the two fitting allowances, 3 inches, leaving an actual pipe length of 8 ft 3 inches.




Dimensions *G* and *H* in Table 1 show the distance to subtract from pipe length where couplings or unions are inserted in the line. Table 2 shows similar allowances for reducers.

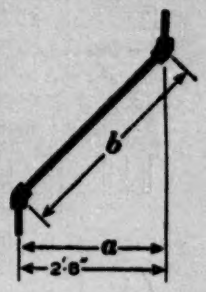
*Example:* Suppose it is necessary to use a union in the line in the previous example. The pipe length between the elbow and the tee must still be 8 ft 3 inches with the union added. To take an 8-ft 3-inch length of pipe, cut it, and insert the union would result in a length greater than 8 ft 3 inches. Additional shortening of the length is necessary. According to dimension *G* in Table 1 the necessary allowance for the 2-inch union is 1-13/16 inches. Subtracting this from 8 ft 3 inches gives us a total length of 8 ft 1-3/16 inches for the two pieces of pipe between the elbow and the tee.



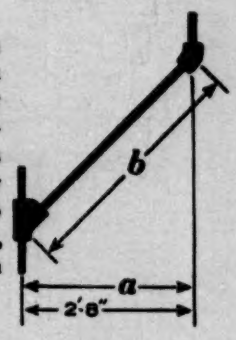

When distances between fittings are short, standard nipples can be used. Nipples are available in lengths up to 12 inches, with graduations at ½-inch intervals for shorter pieces and at inch intervals for longer pieces. (When no nipple is available in the exact length calculated, frequently the distance between fittings can be changed slightly to accommodate the closest available standard nipple size.) Each pipe diameter has a "close" nipple, lengths of which are given in Table 1. Shortest "long" nipple lengths for each pipe diameter range from ⅜ inch longer than the close nipple for the smaller pipe diameters to 1½ inches longer for the larger pipe diameters.

Dimensions *L* and *M* in Table 1 indicate the amount of "offset" to allow between center-lines when using street elbows, 90 degrees or 45 degrees. Center to center distance on a 45° diagonal is 1.412 times the leg distance. If the vertical or horizontal distance between center-lines of fittings is known, the length of the 45-degree measurement between fittings can be calculated. From this must be subtracted fitting allowances taken from Table 1.

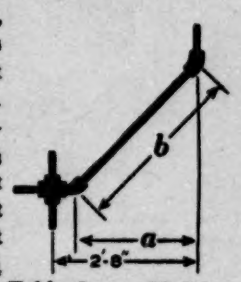
*Example:* A vertical 1½-inch pipe line is to be offset 45 degrees, using two 45-degree elbows. The horizontal distance *(a)* between the center-lines must be 2 ft 8 inches. The diagonal distance *(b)* between the two center-lines will be 2 ft 8 in × 1.412 or 3 ft 9¼ inches. From Table 1, dimension *B*, the fitting allowance to subtract for each 45-degree elbow is ¾ inch, a total of 1½ inches. The actual length of the pipe between the elbows will be 3 ft 9¼ inches less 1½ in., or 3 ft 7¾ in.




*Example:* A slight change in the above example makes use of a Y-bend. The fitting allowance for the Y-bend, from Table 1, dimension *E*, is 2⅝ inches, which is greater than the 45-degree elbow allowance. The sum of the two fitting allowances is 3⅜ inches, which makes the actual pipe length 3 ft 5⅞ inches.



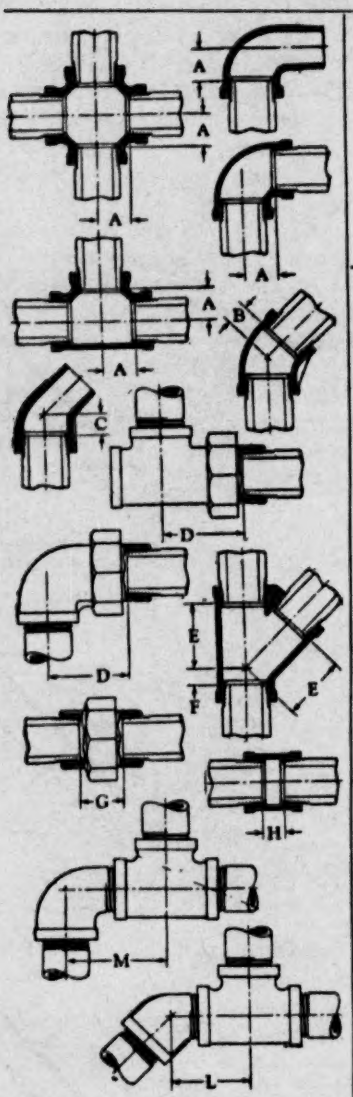

*Example:* A third example, somewhat more complicated, is shown here. A 45-degree street elbow is screwed into a cross. This shortens *a*, according to dimension *L*, Table 1, by 3⅛ inches. Distance *a* is now 2 ft 8 inches less 3⅛ inches, or 2 ft 4⅞ inches. Distance *b* is 2 ft 4⅞ in. × 1.412 or 3 ft 4¾ inches. Fitting allowances from Table 1 are 11/16 inch for the 45-degree street elbow (dimension *C*) and ¾ inch for the regular 45-degree elbow (dimension *B*), a total of 1-7/16 inches. Pipe length is 3 ft 4¾ inches less 1-7/16 inches, or 3 ft 3-5/16 inches.




Where valves are concerned, or where fittings not included in the tables are used, the table of standard thread engagements may be of help. The thread engagement distance subtracted from the end-to-center-line dimension of the fitting or valve (obtained by measurement) will give the amount to subtract from the pipe-line measurement in order to determine actual pipe length.

## TABLE 1. DIMENSIONS OF SCREWED MALLEABLE IRON FITTINGS

(All dimensions in inches)

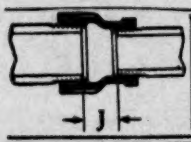



| Dimension Symbol | Pipe Diameter | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ⅛ | ¼ | ⅜ | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 |
| | Dimension | | | | | | | | | | |
| A | 3/16 | 3/16 | 5/16 | 5/8 | 3/4 | 13/16 | 1 1/16 | 1 1/4 | 1 1/2 | 1 3/4 | 2 1/8 |
| B | 1/4 | 3/8 | 7/16 | 3/8 | 7/16 | 7/16 | 5/8 | 3/4 | 15/16 | 1 | 1 3/16 |
| C | 3/16 | 1/4 | 5/16 | 5/16 | 3/8 | 3/8 | 5/16 | 11/16 | 15/16 | ... | ... |
| D | ... | 1 5/16 | 1 1/2 | 1 5/8 | 1 7/8 | 2 3/16 | 2 1/2 | 2 11/16 | 3 1/8 | ... | ... |
| E | ... | ... | 1 1/16 | 1 3/16 | 1 1/2 | 1 3/4 | 2 1/4 | 2 5/8 | 3 1/4 | 3 3/4 | 4 5/16 |
| F | ... | ... | 5/16 | 1/4 | 3/16 | 1/4 | 7/16 | 1/2 | 11/16 | 5/8 | 11/16 |
| G | ... | 1 | 1 1/8 | 1 3/16 | 1 5/16 | 1 3/16 | 1 5/8 | 1 11/16 | 1 13/16 | 2 5/16 | 2 5/16 |
| H | 7/16 | 5/16 | 7/16 | 5/16 | 3/8 | 5/16 | 5/16 | 3/4 | 1 | 1 | 1 3/16 |
| L | 1 1/4 | 1 3/8 | 1 5/8 | 1 13/16 | 2 1/16 | 2 5/16 | 2 3/4 | 3 1/8 | 3 3/4 | ... | ... |
| M | 1 3/16 | 1 5/8 | 2 | 2 1/4 | 2 5/8 | 2 15/16 | 3 1/2 | 3 15/16 | 4 3/4 | 5 5/16 | 6 5/8 |
| Close Nipple Length | 3/4 | 7/8 | 1 | 1 1/8 | 1 3/8 | 1 1/2 | 1 5/8 | 1 3/4 | 2 | 2 1/2 | 2 5/8 |
| Thread Engagement | 1/4 | 3/8 | 3/8 | 1/2 | 5/16 | 11/16 | 11/16 | 11/16 | 3/4 | 15/16 | 1 |

Data for larger size fittings are as follows: For 3½, 4, 5 and 6 inch fittings, A is 2⅜, 2⅝, 3¼ and 3 13/16, respectively; B is 1 5/16, 1½, 1 13/16, and 2⅛, respectively; close nipple length is 2¾, 2⅞, 3 and 3⅛, respectively; thread engagement is 1 1/16, 1⅛, 1¼ and 1 5/16, respectively. For 4 inch fittings, E is 5 13/16, F is 13/16, H is 1⅞ and M is 8 5/16 inches.

## TABLE 2. DIMENSIONS OF SCREWED MALLEABLE IRON REDUCER COUPLINGS

(All dimensions in inches)




| Large Pipe Diameter | ¼ | ⅜ | | ½ | | | ¾ | | | 1 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Small Pipe Diameter | ⅛ | ⅛ | ¼ | ⅛ | ¼ | ½ | ¼ | ⅜ | ½ | ¼ | ⅜ | ½ | ¾ |
| Dimension J | ⅜ | ½ | ⅜ | ½ | ⅜ | ⅜ | ½ | ½ | ⅜ | ⅝ | ⅝ | ½ | 7/16 |

| Large Diameter | 1¼ | | | 1½ | | | | 2 | | | | 2½ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Small Diameter | ½ | ¾ | 1 | ½ | ¾ | 1 | 1¼ | ½ | ¾ | 1 | 1¼ | 1½ | 1 | 1¼ | 1½ | 2 |
| Dimension J | ⅜ | 13/16 | 11/16 | 1 1/8 | 1 1/16 | 15/16 | 15/16 | 1 5/16 | 1 1/2 | 1 3/8 | 1 3/8 | 1 3/8 | 1 5/8 | 1 5/8 | 1 5/8 | 1 5/16 |

| Large Diameter | 3 | | | | | 3½ | | | 4 | | | | | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Small Diameter | 1 | 1¼ | 1½ | 2 | 2½ | 2 | 2½ | 3 | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4 |
| Dimension J | 2 | 2 | 2 | 1 13/16 | 1 | 2 3/16 | 2 | 1 15/16 | 2 5/16 | 2 1/2 | 2 5/16 | 2 1/4 | 2 3/16 | 2 3/4 | 1 15/16 |

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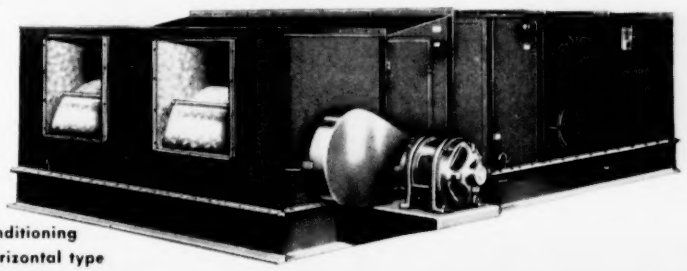

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***Headquarters for Air Handling and Conditioning Equipment***

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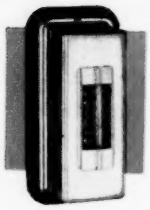
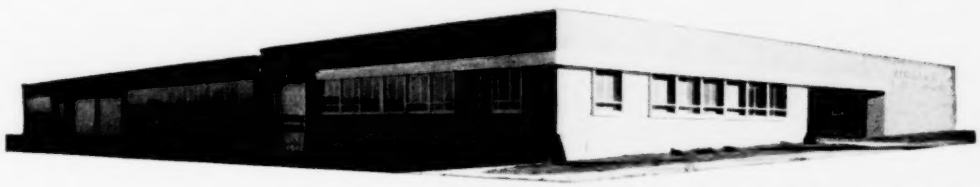
# Another Example of the *Adaptability* of

# JOHNSON AUTOMATIC TEMPERATURE CONTROL





J. J. Hanighen Company, Inc., Office and Warehouse, Omaha, Neb. Noel S. Wallace, architect, Omaha. J. J. Hanighen Company, Inc., mechanical engineers and heating, ventilating and air conditioning contractors.

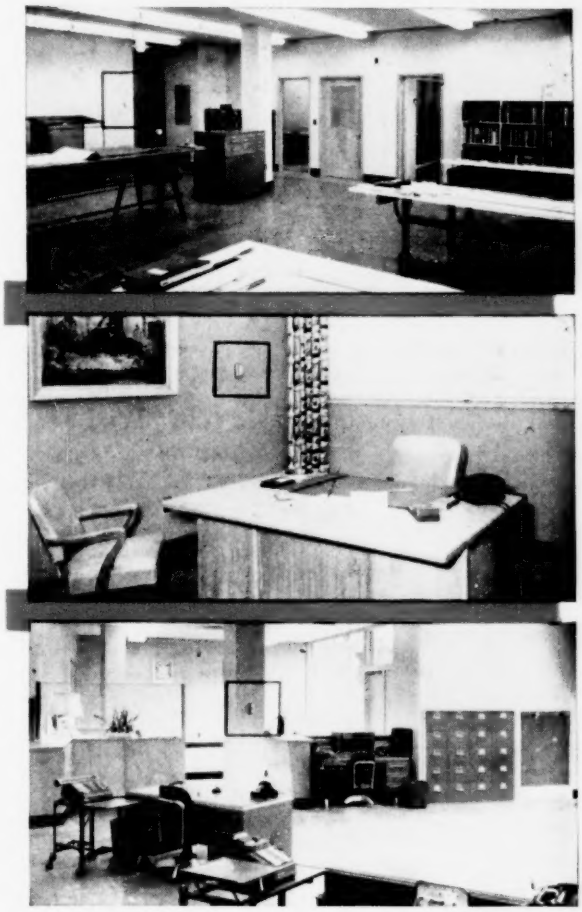
One of the most modern office and warehouse buildings recently constructed is the J. J. Hanighen Company, Inc., plant in Omaha, Nebraska, a firm which specializes in heating, air conditioning, plumbing and power plant installations.

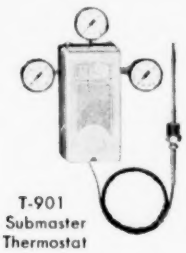
This unusual building is another example of the adaptability of Johnson Automatic Temperature Control. The entire building is heated by radiant panels in floors and outside walls. Johnson Master-Submaster Control, regulating the valve in the steam supply to a hot water converter, supplies hot water to the panels at the exact temperature dictated by the outdoor temperature. Superimposed upon this weather-compensated system are Johnson T-403 *individual room* thermostats, operating Johnson V-149 water valves on the supply to individual panels and providing the optimum in room-by-room comfort and fuel savings.

Behind-the-scenes, Johnson Master-Submaster Control operates Johnson valves and damper operators on the central fan ventilating and air conditioning system which serves the general office, private offices, reception room, conference room and large engineering and drafting room.

All control apparatus is combined in a planned-for-the-purpose, installed-for-the-purpose automatic control system, resulting in maximum comfort and savings for every heating and cooling dollar.

Johnson Automatic Control Systems are designed specifically for each individual installation. Let a Johnson engineer from a nearby branch provide the answer to your temperature control problems. A talk involves no obligation. Ask him to call anytime. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.





T-901
Submaster
Thermostat

T-900 Master
Thermostat

D-251
Piston
Damper
Operator

V-149
Water Valve

V-103
Steam Valve

**JOHNSON** *Automatic Temperature and Air Conditioning* **CONTROL**

**MANUFACTURE • APPLICATION • INSTALLATION • SINCE 1885**